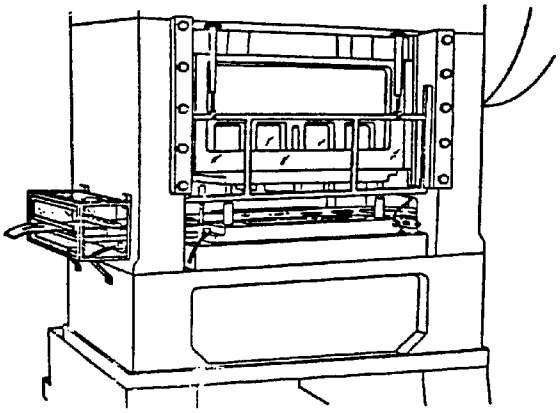
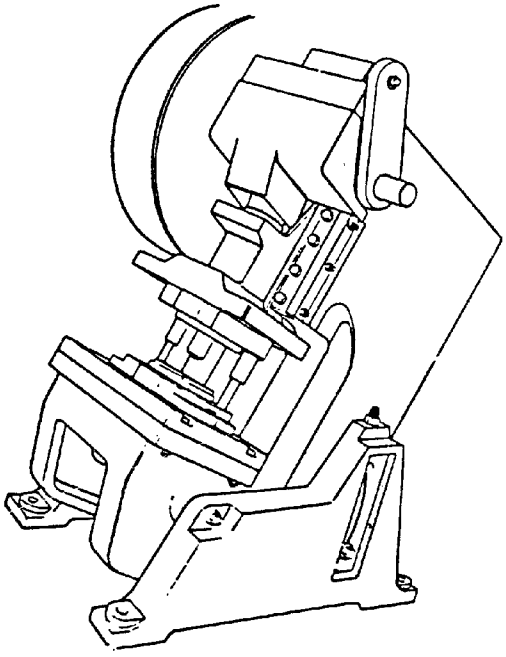
MECHANICAL POWER PRESS SAFETY





Prepared By

Kentucky Labor Cabinet
Division of Education and Training

1047 U.S. 127 South, Suite 4
Frankfort, KY 40601

This booklet has been prepared to aid employers and employees in their efforts to comply with the rules and regulations of Kentucky's Occupational Safety and Health Program as they pertain to mechanical power presses.

If this manual meets the needs of your establishment, it may be used as written. If you have previously established and are maintaining a safety program, you can continue to use your program provided that the essential elements covered in this booklet are also addressed in your program. Use of all or part of this manual does not relieve employers of their responsibility to comply with other applicable local, state or federal laws.

It is intended that this manual be enhanced and continuously improved by the employer. Any section of this manual may be modified by the employer to accommodate actual operations and work practices, provided that the original intent of that section is not lost.

If there is a safety rule, policy, or procedure appropriate for the work or work environment which has not been included, or if a rule included in this manual is inappropriately written, then a new safety rule, policy, or procedure should be added to improve the manual.

The standards referenced throughout the booklet are from Kentucky's Occupational Safety and Health Standards for General Industry, as adopted from 29 Code of Federal Regulations (CFR) Part 1910 under the authority of 803 Kentucky Administrative Regulations (KAR) 2:020.

It is imperative that the user of this booklet have a current copy of the Kentucky Occupational Safety and Health Standards for General Industry. Many references will be made to specific sections of the General Industry Standards throughout this booklet.

Parenthetical statements can be found throughout this booklet to provide insight and clarification only.

This material has been developed by the Kentucky Labor Cabinet, Occupational Safety and Health Program, Division of Education and Training, for use in its training programs. The information is believed to be reliable. However, the Kentucky Labor Cabinet assumes no responsibility for the strict accuracy of its discussions and interpretations. If any questions arise after using this booklet as a "self inspection" tool, please contact one of the offices listed on the back cover of this booklet.

Illustrations reprinted with permission.

TABLE OF CONTENTS

MECHANICAL POWER PRESS SAFETY

I. BACKGROUND AND DEFINITIONS

A. APPLICATIONS OF MECHANICAL POWER PRESSES

Press. A mechanically powered machine that shears, punches, forms, or assembles metal or other material by means of cutting, shaping, or combination dies attached to slides. A press consists of a stationary bed (or anvil), and a slide (or slides) having a controlled reciprocating motion toward and away from the bed surface, the slide being guided in a definite path by the frame of the press.

Major components of a mechanical power press are the frame, motor, flywheel, crankshaft, clutch and brake.

Crankshafts purpose = convert circular motion to linear motion.

Clutches purpose = connect the rotating flywheel with the crankshaft causing the press to stroke.

The clutch on a mechanical power press is either a full revolution or a part revolution clutch. The full revolution clutch transfers motion from the flywheel to the ram or slide through a mechanical connection. The connection cannot be broken until one revolution has been completed. A part revolution clutch is also referred to as a friction clutch. Motion is transmitted by two pieces of material being pushed against one another. This type of clutch can be disengaged at any time.

Brake purpose = stop the motion of the slide or ram. The brake may be a constant drag type (common on a full revolution clutch machine) or it may be engaged only while the clutch is disengaged (common on a part revolution clutch machine).

B. TYPES OF MECHANICAL POWER PRESSES

Mechanical power presses may be classified by functional type and structural type.

1. Structural Types of Mechanical Power Presses

Mechanical power presses range in size from units designed for bench mounting, with work areas of a few square inches, to machines that stand tens of feet high, with work areas tens of feet square. Mechanical power presses may be used to produce parts as small as wire terminals to as large as a truck frame.

Two general frames used for mechanical power presses are the "C" frame and the straight side frame.

The "C" frame is similar to a "C" clamp in appearance, with the lowest part of the "C" supporting the bed and the slide mounted in the upper part of the "C".

a. Classes of "C" Frame Presses

i. OBI (Open Back Inclined) - The OBI press has a "foot" or base that supports the main "C" frame member. The base is slotted to allow the main frame to be tilted back so that gravity can assist the "blow off" mechanism in removing the fabricated material or scrap through the open back of the press.

ii. Gap Press - The gap press is a basic "C" frame press, usually with a base and operating frame cast in one piece which cannot be inclined.

iii. Horn Press - The horn press uses a two piece "C" frame structure. The lower part of the "C" frame is adjustable. A separate frame member that can be adjusted up or down to reduce the gap in the "C".

b. Straight Side Frame

The frame consists of a bed to which a four corner post arrangement called uprights are attached. The uprights support the final frame member, the crown of the machine. The slide of the machine is attached to a crankshaft in the crown of the press and moves vertically between the uprights.

2. Functional Types of Mechanical Power Presses

All mechanical power presses use an electric motor as the drive source, which stores energy to enable the press to "crunch" through metal or other material at the bottom of the stroke. Although other types of power presses are mechanical in nature, such as hydraulic presses, the term mechanical power press is used to refer to those presses that drive the press slide with a crankshaft. The crankshaft is supported by main bearings, and the slide hangs from the crankshaft through one or more connections called pitmans. The slide is at its highest point when the crankshaft throw is straight up, and at its lowest when the crankshaft is straight down (bottom dead center); therefore, the stroke of the press is twice the crankshaft throw.

The working area of the machine is the space between the slide and the bolster plate that sits on the bed of the press. The shut height is adjustable. The shut height is the distance between the bottom of the slide and the top of the bolster plate, with the crankshaft at bottom dead center.

To stroke the press, the crankshaft is coupled to the flywheel which always turns when the motor is running. This coupling may be accomplished directly or through gears. Gears allow the press to travel slower, exerting more force. Flywheels on a non-geared press are always located on the crankshaft. If bearings freeze up, the press will begin stroking.

A clutch is used to connect the flywheel to the crankshaft. The type of clutch used determines if the press is a part or full revolution clutch mechanical power press.

The full revolution clutches are positive clutches that cannot slip. Once engaged, the full revolution clutch drags the crankshaft through one complete revolution before it can be disengaged by a mechanism that physically pulls the clutch pin, key, or jaw free of the flywheel.

The full revolution clutch has a limited number of engaging points. When the operator trips the clutch mechanism, the pin falls against the surface of the flywheel or gear and "rides" the surface until

falling into an engaging point. When the pin falls into an engaging point, the flywheel turns the crankshaft and strokes the slide.

The full revolution mechanical power press uses a friction brake that is always applied to hold the slide stationary when the clutch is not applied. When engaged, the clutch overrides the friction brake. The brake is usually applied directly to the crankshaft.

The part revolution mechanical power press sometimes uses a positive clutch that is forced to engage and disengage by air pressure, springs, etc. Normally, a radial or disk type friction clutch is used for more torque. These types of clutches are where two plates get squeezed together and can be engaged or disengaged. At this point in the slide stroke, the clutch is usually engaged with air pressure and released with a lack of air pressure. The brakes are spring applied air released brakes.

C. FUNCTIONAL TYPES OF MECHANICAL POWER PRESSES

1. Die Installation

Because most presses are used in the manufacturing of various size parts, dies must be changed. To remove a die, the die setter brings the slide down until the upper die mates with the lower die section. The bolts which attach the upper die section are then removed. The slide is returned to the top position, and the bolts are then removed from the lower die section which secures the lower die to the bolster plate.

To install a die, the die is placed in its proper position in the machine. The lower die is secured to the bolster plate. The shut height is then adjusted to assure that it is not less than the die height. The slide is then brought down to the bottom position, and the upper section of the die is secured to the slide and the slide is returned to the top position. The method of mating dies when setting or removing dies determines the die setting mode.

a. Die Setting Modes for Full Revolution Clutch Machines

i. Bar Mode - With the motor off and the flywheel completely stopped, the die setter engages the clutch, locking the flywheel and crankshaft together, by inserting a metal bar in the outer face of the flywheel and rotating the flywheel.

Then manually turn the crankshaft until the slide reaches the down position.

ii. Jog Mode - With the motor off and the flywheel at rest, the die setter operates the stop/start buttons to quickly cause the flywheel to turn small distances.

b. Die Setting Modes for Part Revolution Mechanical Power Presses

Sometimes Bar Mode and Jog Mode are used.

i. Inch Mode - With the motor on and the flywheel turning at full speed, the die setter operates controls to engage and release the clutch rapidly.

ii. Dead Motor Inch - With the motor off and the flywheel coasting, the die setter operates controls rapidly to engage and release the clutch. The slide travels shorter distances in this mode and the die setter can achieve finer control.

iii. Auxiliary Motor and Gears - (Very large presses are normally found in the auto industry.) The slide is brought down into a die setting position on these presses by use of a motor and gear arrangement to give greater control of the press slide.

2. Production Modes of Mechanical Power Presses

There are three main factors to be considered in production modes:

- Press strokes automatically.

- Press strokes continuously.

- Material to be fabricated is fed manually or automatically. Possible production modes are the same for both part and full revolution mechanical power presses.

a. Production Modes - Manual Control of Press

i. Single Stroke with Manual Feed

Operator places part into the point of operation and tells the machine to make one stroke then stop.

ii. Single Stroke with Automatic Feed

Operator manually instructs the machine to make one stroke then stop. Material is fed into the machine automatically.

iii. Maintained Continuous with Manual Feed

Continuous stroking which requires the operator to manually maintain pressure on operating controls. Normally used where operator strip feeds material through the dies.

iv. Maintained Continuous with Automatic Feed

The operator is used as an observer who stops the feed if parts jam, misfeed, or the end of the roll is reached.

b. Production Modes - Automatic Control of Press

i. Continuous with Manual Feeding

Press runs automatically, operator manually feeds strip material into the dies.

ii. Continuous with Automatic Feeding

Press is started by the operator, strokes continuously with material fed into dies and removed automatically. Monitors are used to stop the press if jam, misfeed, or end of roll occurs.

iii. Single Stroke with Feed Automatically Initiating Each Press Stroke

The "feed" places the material into position and tells the press to make a single stroke and stop. The material is again moved into position by the "feed" and the process is repeated.

iv. Continuous on Demand

Material stacks up until a specific amount is accumulated then the press

goes automatic until material is exhausted. Press stops, repeats when specific amount of material stacks up again.

II. STANDARDS AND REQUIREMENTS FOR MECHANICAL POWER PRESSES

A. GENERAL MACHINE GUARDING REQUIREMENTS

Sections 1910.212(a) and 1910.219(b) are general guidelines for all machines and mechanical power presses must comply with these standards, as well as the specific standard 1910.217.

1910.212(a)(1) -- Types of Machine Guarding. One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks. Examples of guarding methods are barrier guards, two-hand tripping devices, electronic safety devices, etc.

1910.212(a)(2) -- General requirements for machine guards. Guards shall be affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible. The guard shall be such that it does not offer an accident hazard in itself.

1910.212(a)(3)(i) -- Point of operation guarding. Point of operation is the area on a machine where work is actually performed upon the material being processed.

1910.212(a)(3)(ii) -- The point of operation of machines whose operation exposes an employee to injury shall be guarded. The guarding device shall be in conformity with any appropriate standards therefor, or, in the absence of applicable specific standards, shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle.

1910.212(a)(3)(iii) -- Special hand tools for placing and removing material shall be such as to permit easy handling of material without the operator placing a hand in the danger zone. Such tools shall not be in lieu of other guarding required by this section, but can only be used to supplement protection provided.

1910.212(a)(3)(iv) -- The following are some of the machines which usually require point of operation guarding:

(a) Guillotine cutters
(b) Shears
(c) Alligator shears
(d) Power presses
(e) Milling machines
(f) Power saws
(g) Jointers
(h) Portable power tools
(i) Forming rolls and calendars

1910.212(a)(4) -- Barrels, containers, and drums. Revolving drums, barrels and containers shall be guarded by an enclosure which is interlocked with the drive mechanism, so that the barrel, drum, or container cannot revolve unless the guard enclosure is in place.

1910.217(a)(5) -- Excluded machines - Press brakes, hydraulic and pneumatic power presses, bulldozers, hot bending and hot metal presses, forging presses and hammers, riveting machines and similar types of fastener applicators are excluded from the requirements of this section.

*NOTE - Guard = barrier
Guarding = barrier and device
Guarded = barrier and device

29 CFR, Part 1910.219 - Mechanical Power Transmission Apparatus

1910.219(b)(1) -- Prime-mover guards (flywheels). Flywheels located so that any part is seven (7) feet or less above floor or platform shall be guarded in accordance with the requirements of this subparagraph:

1910.219(b)(1)(i) -- With an enclosure of sheet, perforated, or expanded metal, or woven wire;

1910.219(b)(1)(ii) -- With guard rails placed not less than fifteen (15) inches nor more than twenty (20) inches from rim. When flywheel extends into pit or is within 12 inches of floor, a standard toeboard shall also be provided;

1910.219(b)(1)(iii) -- When the upper rim of flywheel protrudes through a working floor, it shall be entirely

enclosed or surrounded by a guardrail and toeboard.

1910.219(b)(1)(vi) -- Wherever flywheels are above working areas, guards shall be installed having sufficient strength to hold the weight of the flywheel in the event of a shaft or wheel mounting failure.

1910.219(b)(2) -- Cranks and connecting rods. Cranks and connecting rods, when exposed to contact shall be guarded in accordance with paragraphs (m) and (n) of this section, or by a guardrail as described in paragraph (o)(5) of this section.

1910.219(c)(4)(i) -- Projecting shaft ends. Projecting shaft ends shall present a smooth edge and end and shall not project more than one-half the diameter of the shaft unless guarded by nonrotating caps or safety sleeves.

1910.219(f)(1) -- Gears, sprockets, and chains (gears). Gears shall be guarded in accordance with one of the following methods:

1910.219(f)(1)(i) -- By a complete enclosure; or

1910.219(f)(1)(ii) -- By a standard guard as described in paragraph (o) of this section, at least seven (7) feet high extending six (6) inches above the mesh point of the gears; or

1910.219(f)(1)(iii) -- By a band guard covering the face of gear and having flanges extended inward beyond the root of the teeth on the exposed side or sides. Where any portion of the train of gears guarded by a band guard is less than six (6) feet from the floor a disk guard or a complete enclosure to the height of six (6) feet shall be required.

1910.219(f)(3) -- Sprockets and chains. All sprocket wheels and chains shall be enclosed unless they are more than seven (7) feet above the floor or platform. Where the drive extends over other machine or working areas, protection against falling shall be provided. This subparagraph does not apply to manually operated sprockets.

B. GENERAL MECHANICAL POWER PRESS REQUIREMENTS

1. Timetable for Compliance and Excluded Machines

All excluded machines are covered in 1910.212 and 1910.219; however, many of the guarding methods

specified in 1910.217 are the only practical methods for use in guarding "excluded machines".

1910.217(a)(1)-(3) -- General Requirements. Revoked

1910.217(a)(4) -- Reconstruction and modification. It shall be the responsibility of any person reconstructing, or modifying a mechanical power press to do so in accordance with paragraph (b) of this section.

1910.217(a)(5) -- Excluded machines. Press brakes, hydraulic and pneumatic power presses, bulldozers, hot bending and hot metal presses, forging presses and hammers, riveting machines and similar types of fastener applicators are excluded from the requirements of this section.

2. General Construction Requirements for Mechanical Power Presses

1910.217(b)(1) -- Mechanical power press guarding and construction, general (Hazards to personnel associated with broken or failing machine components). Machine components shall be designed, secured, or covered to minimize hazards caused by breakage, or loosening and falling or release of mechanical energy (i.e. broken springs).

1910.217(b)(2) -- Brakes. Friction brakes provided for stopping or holding a slide movement shall be inherently self-engaging by requiring power or force from an external source to cause disengagement. Brake capacity shall be sufficient to stop the motion of the slide quickly and capable of holding the slide and its attachments at any point in its travel.

Springs are used to apply brakes and disengage the clutch on part revolution mechanical power presses. On full revolution clutch presses, a drag brake that is always engaged is normally used.

1910.217(b)(9) -- Slide counterbalance systems

1910.217(b)(9)(i) -- Spring counterbalance systems when used shall incorporate means to retain system parts in event of breakage.

1910.217(b)(9)(ii) -- Spring counterbalances when used shall have the capability to hold the slide and its attachments at midstroke, without brake applied.

1910.217(b)(9)(iii) -- Air counterbalance cylinders shall incorporate means to retain the piston and rod in case of breakage or loosening.

1910.217(b)(9)(iv) -- Air counterbalance cylinders shall have adequate capability to hold the slide and its attachments at any point in stroke, without brake applied.

1910.217(b)(9)(v) -- Air counterbalance cylinders shall incorporate means to prevent failure of capability (sudden loss of pressure) in event of air supply failure.

NOTE: Check the valve for lower bearing wear, positive force on gear and pressure on motor.

Look at air pressure for air counterbalance
Look at manufacturer's recommended air pressure
Look at top die weight
Compare for overloading

Original Purpose of Counterbalance

a. Save wear on bearings.

b. Lengthen motor life.

c. Large presses have/had gears, counterbalance saves wear on gears.

d. Proper adjustment weight, preventing slide (ram) from falling, enhanced braking ability on the downstroke.

Spring Counterbalances

When spring counterbalances are used, the spring is on a rod guided by an attachment to the slide of the press. As the slide moves downward, the spring is compressed, exerting an upward force on the slide.

An adjustment nut is provided on the rod to increase or decrease spring compression to offset different die weights. The more the spring is compressed the more force is exerted on the slide. Force is greater near the bottom of the stroke, less force near the top of the stroke. Therefore, the force exerted by the spring at midstroke is equal to the average force exerted by the spring throughout the stroke. The force of the spring should offset the weight of the slide and its attachments at midstroke.

Air counterbalance systems consist of an air cylinder attached to the crown of the press with

the cylinder rod attached to the slide. The

air cylinder exerts an upward force on the slide. The air counterbalance exerts a more equal force throughout the stroke than does the spring counter-balance. Proper air counterbalance is obtained when the counterbalance can hold the slide stationary at any point in the stroke without help from the brake. The requirement that air counterbalance cylinders not suddenly lose pressure, in the event of air supply failure, is necessary to prevent sudden loss of braking ability, as many point of operation devices depend on the braking ability of the press. A method to meet this requirement is with a check valve which permits air flow into the air cylinder but prevents air from flowing out of the cylinder.

1910.217(b)(10) -- Air controlling equipment. Air controlling equipment shall be protected against foreign material and water entering the pneumatic system of the press. A means of air lubrication shall be provided when needed.

Many pneumatic systems on presses such as air valves, air cylinders, etc. have moving parts. Moisture and contamination can cause "binding" or sluggish operation as can the lack of lubri-cation.

Full revolution presses have air for palm button limit switches, valves, foot pedals, etc.

EXAMPLE - foot pedal (air should be 50-60 p.s.i.) If there is too much air pressure, press will double trip.

Part revolution - too much air on a clutch can cause pieces of the clutch to break off, wedge, and cause the press to double or continuously trip.

1910.217(b)(11) -- Hydraulic equipment. The maximum anticipated working pressures in any hydraulic system on a mechanical power press shall not exceed the safe working pressure rating of any component used in that system.

1910.217(b)(12) -- Pressure vessels. All pressure vessels used in conjunction with power presses shall conform to the American Society of Mechanical Engineers Code for Pressure Vessels, 1968 Edition.

3. General Electrical Requirements

1910.217(b)(8)(i) -- Electrical. A main power disconnect switch capable of being locked only in the OFF position shall be provided with every power press control system.

Overhead bus bars do not comply.

Purpose - The main power disconnect is the ultimate safety feature of the machine. The press cannot run out of control, or present an electrical hazard if no power is supplied.

1910.217(b)(8)(ii) -- The motor start button shall be protected against accidental operation.

This requirement is specifically important where the die setter uses the Bar Mode for die setting purposes.

1910.217(b)(8)(iii) -- All mechanical power press controls shall incorporate a type of drive motor starter that will disconnect the drive motor from the power source in event of control voltage or power source failure, and require operation of the motor start button to restart the motor when voltage conditions are restored to normal.

Mechanical power presses usually use magnetic "across the line" motor starters for the single speed high slip through phase a.c. induction motors that generally drive the majority of power presses, although occasionally d.c. motor drives will be found on variable speed automatic presses.

1910.217(b)(8)(iv) -- All a.c. control circuits and solenoid coils shall be powered by not more than a nominal 120 volt a.c. supply obtained from a transformer with an isolated secondary.

d.c. - direct current
a.c. - alternating current

a.c. is allowed because d.c. cannot be transformed. Control circuits can be no more than 120V because any part of a control circuit may require repair by a maintenance person.

1910.217(b)(8)(v) -- All clutch/brake control electrical circuits shall be protected against the possibility of an accidental ground in the control circuit causing false operation of the press.

Two methods of meeting this requirement are:

a. Controls are designed to require the presence of a control voltage to make the press stroke. (A ground gives the absence.)

b. The control is fused at the source of the control voltage. An accidental ground will blow the fuse and remove all power from the controls.

1910.217(b)(8)(vi) -- Electrical clutch/brake control circuits shall incorporate features to minimize the possibility of an unintended stroke in the event of the failure of a control component to function properly, including relays, limit switches and static output circuits.

If minimize is taken literally, then all controls on all presses should be self-checking design as required in (b)(13). New ANSI will read: "When the safety of the operator depends on ability of controls, then the press will have control reliability".

C. FULL REVOLUTION MECHANICAL PRESS

1. Control and Operating Mechanism Requirements

1910.217(b)(3)(i) -- Machines using full revolution positive clutches. Machines using full revolution clutches shall incorporate a single-stroke mechanism.

A single stroke mechanism provides only one stroke of the press when the operator operates the tripping mechanism even if the operator continues to activate the tripping mechanism throughout the stroke.

A method to provide or install a single stroke mechanism on presses that were not manufactured with a single stroke mechanism (as shown on Page 73) is to interrupt the mechanical linkage to the clutch mechanism and insert an air cylinder to pneumatically "pull" the clutch mechanism.

2. Electric Tripping Mechanism

When the operator actuates the electric tripping mechanism, an electrical control operates an air valve which provides compressed air to retract the air cylinder and trip the mechanical clutch mechanism. The electric control must provide an output that keeps the air cylinder retracted long enough for the clutch to engage, but not long enough for the crankshaft to make a complete revolution (which could result in double tripping).

1910.217(b)(3)(ii) -- If the single-stroke mechanism is dependent upon spring action, the spring(s) shall be of the compression type, operating on a rod or guided within a hole or tube, and designed to prevent inter-leaving of the spring coils in event of breakage.

The mechanical clutch mechanism is usually returned by a spring to the neutral position. Failure of the spring to return the clutch mechanism would result in multiple strokes of the press. Refer to the Illustrations on Page 73.

The air cylinder used to pull the linkage, on Page 79, is retracted by air pressure but returned by a spring, as the air valve that controls the compressed air from the cylinder turns off and exhausts the compressed air from the cylinder. The requirement that the springs be of the compressed type, with non-interleaving coils and guided by a rod within the tube, insures that the spring will lose very little of its capacity even if broken in several places.

1910.217(b)(4)(i) -- Foot pedals (treadle). The pedal mechanism shall be protected to prevent unintended operation from falling or moving objects or by accidental stepping onto the pedal.

1910.217(b)(4)(ii) -- A pad with a nonslip contact area shall be firmly attached to the pedal.

1910.217(b)(4)(iii) -- The pedal return spring(s) shall be of the compression type, operating on a rod or guided within a hole or tube, or designed to prevent inter-leaving of spring coils in event of breakage.

1910.217(b)(4)(iv) -- If pedal counterweights are pro-vided, the path of the travel of the weight shall be enclosed.

Counterweights are sometimes used rather than springs on foot pedals to pull the weight back up. When counter-weights are used to return the pedal, an enclosed path of travel reduces the possibility of something accidentally restricting the counterweight and causing double or multiple strokes (such as an object getting under the counterweight).

1910.217(b)(5)(i) -- Hand operated levers. Hand lever-operated power presses shall be equipped with a spring latch on the operating lever to prevent premature or accidental tripping.

1910.217(b)(5)(ii) -- The operating levers on hand-tripped presses, having more than one operating station, shall be interlocked to prevent the tripping of the press except by the "concurrent" use of all levers.

The concurrent activation of levers on multiple operators stations means that all levers have to be activated before the press will trip.

1910.217(b)(6)(i) -- A two-hand trip shall have the individual operator's hand controls protected against unintentional operation and have the individual operator's hand controls arranged by design and construction and/or separation to require the use of both hands to trip the press and use a control arrangement requiring concurrent operation of the individual operator's hand controls.

1910.217(b)(6)(ii) -- Two-hand trip systems on full revolution clutch machines shall incorporate an anti-repeat feature.

1910.217(b)(6)(iii) -- If two-hand trip systems are used on multiple operator presses, each operator shall have a separate set of controls.

The purpose of requiring two-hand controls for each operator is to qualify the two-hand controls as a safety device. To qualify as a safety device, the two-hand controls must also meet those requirements in 1910.217(c)(3)(viii). The "concurrent operation" of hand controls means that both palm buttons must be operated before the press will trip. The anti-repeat requirement is effectively the same as the single stroke requirement.

Approximate Costs:

Anti-repeat	$2,000
Single stroke	$ 125

All hand controls must be released before the press will make another stroke.

3. Point of Operation Guarding for Full Revolution Mechanical Presses

a. General Requirements

1910.217(c)(1)(i) -- Safeguarding the point of operation. It shall be the responsibility of the employer to provide and insure the usage of "point of operation guards" or properly applied and adjusted point of operation devices on every operation performed on a mechanical power press. See Table 0-10. (Page 80)

1910.217(c)(1)(ii) -- The requirement of subdivision (i) of this subparagraph shall not apply when the point of operation opening is one-fourth inch or less. See Table 0-10. (Page 80)

Safeguarding the point of operation may be done either by a properly applied guard or device. The allowable opening size in guards are specified in Table 0-10. (Page 80) Guards physically prevent entry. Devices allow the operator to reach into the point of operation to feed or remove parts of the upstroke of the machine cycle.

b. Design and Construction Requirements for Point of Operation Guards

1910.217(c)(2)(i) -- Point of operation guards. Every point of operation guard shall meet the following design, construction, application and adjustment requirements:

1910.217(c)(2)(i)(a) -- It shall prevent entry of hands or fingers into the point of operation by reaching through, over, under or around the guard;

1910.217(c)(2)(i)(b) -- It shall conform to the maximum permissible openings of Table 0-10; (Page 80)

1910.217(c)(2)(i)(c) -- It shall, in itself, create no pinch point between the guard and moving machine parts;

1910.217(c)(2)(i)(d) -- It shall utilize fasteners not readily removable by operator, so as to minimize the possibility of misuse or removal of essential parts;

1910.217(c)(2)(i)(e) -- It shall facilitate its inspection, and

1910.217(c)(2)(i)(f) -- It shall offer maximum visibility of the point of operation consistent with the other requirements. (Example - where the jam would occur and or the point of operation, return the dies)

The design and construction requirements of point of operation guards intend to permit no access to the point of operation from any direction at any time during the operating cycle.

The guard shall not create secondary hazards in its place such as:

i. If placed near a rotating shaft, ingoing hazards may occur.

ii. If placed incorrectly with respect to the slide or other linear moving parts of the slide or its attachments, a pinch point may be created between the fixed barrier and moving part.

c. Types of Point of Operation Guards for Full Revolution Clutch Presses

NOTE: Since 1910.217 is a performance standard, OSHA does not specify which type of guard must be used for specific operations.

1910.217(c)(2)(ii) -- A die enclosure guard shall be attached to the die shoe or stripper in a fixed position.

1910.217(c)(2)(iii) -- A fixed barrier guard shall be attached securely to the frame of the press or to the bolster plate.

1910.217(c)(2)(iv) -- An interlocked press barrier guard shall be attached to the press frame or bolster and shall be interlocked with the press clutch control so that the clutch cannot be activated unless the guard itself, or the hinged or movable sections of the guard are in position to conform to the requirements of Table 0-10. (Page 80)

1910.217(c)(2)(v) -- The hinged or movable sections of an interlocked press barrier guard shall not be

used for manual feeding. The guard shall prevent opening of the interlocked section and reaching into the point of operation prior to die closure or prior to the cessation of slide motion. See paragraph (c)(3)(ii) of this section regarding manual feeding through interlocked press barrier devices.

1910.217(c)(2)(vi) -- The adjustable barrier guard shall be securely attached to the press bed, bolster plate, or die shoe, and shall be adjusted and operated in conformity with Table 0-10 (Page 80) and the requirements of this subparagraph. Adjustments shall be made only by authorized personnel whose qualifications include a knowledge of the provisions of Table 0-10 (Page 80) and this subparagraph.

Die Shoe - Main base plate of the die to which other die parts attach, and also the die member that attaches to the bolster plate slide.

Slide - Movable working member that moves up and down with reference to the bolster plate and lower die. The bolster plate attaches to the lower section of a punch press to provide a bearing surface for the lower half of the die.

Stripper - A mechanism, or die part, for removing the parts of material from the punch. (It may be stationary and attached to the lower part of the die, or it may be spring or cam actuated and attached to the upper or lower die.)

d. Barriers That Don't Qualify as Guards

1910.217(c)(2)(vii) -- A point of operation enclosure which does not meet the requirements of this subparagraph and Table 0-10 (Page 80) shall be used only in conjunction with point of operation devices.

Any barrier that does not completely bar access to the point of operation, at all times during the production cycle, does not qualify as a guard.

EXAMPLE - If all paths were blocked to the point of operation except through the front of the machine, or even if one opening existed in the barrier that did conform to Table 0-10, (Page 80) the barrier could not be classified as a guard and would have to be supplemented by a properly applied point of operation device.

4. Types of Point of Operation Devices For Full Revolution Clutch Presses

Of all of the point of operation devices available, many apply to a full revolution clutch press; however, those that do not apply are those which depend on the press stopping before completion of a press stroke.

a. Type "A" Gate

1910.217(c)(3)(ii)(a) -- Point of operation devices. A Type "A" gate or movable barrier device shall protect the operator in the manner specified in paragraph (c)(3)(i)(f) of this section.

1910.217(c)(3)(i)(f) -- Enclosing the point of operation before a press stroke can be initiated, and maintaining this closed condition until the motion of the slide has ceased.

A Type "A" gate or movable barrier device encloses the point of operation before the full revolution clutch can be tripped and stays closed until after the stroke is completed and the slide stops. The machine's tripping mechanism is interlocked with the gate so the press will not trip unless the gate is in the fully down position. This is normally done by electrical or pneumatic limit switches that close as the gate reaches the down stroke. (Check these limit switches. They may not be designed to know when the press stops, in which case a multiple tripping could occur.) The gate is usually driven both up and down by an air cylinder or uses gravity to fall and an air cylinder to pull it back up.

b. Pull Out Devices

1910.217(c)(3)(iv) -- The pull-out device shall protect the operator as specified in paragraph (c)(3)(i)(b) of this section, and shall include attachments for each of the operator's hands.

1910.217(c)(3)(iv)(a) -- Attachments shall be connected to and operated only by the press slide or upper die.

1910.217(c)(3)(iv)(b) -- Attachments shall be adjusted to prevent the operator from reaching into the point of operation or to withdraw the operator's hands from the point of operation

before the dies close.

1910.217(c)(3)(iv)(c) -- A separate pull-out device shall be provided for each operator if more than one operator is used on a press.

1910.217(c)(3)(iv)(d) -- Each pull-out device in use shall be visually inspected and checked for proper adjustment at the start of each operator shift, following a new die setup, and

when operators are changed. Necessary maintenance or repair or both shall be performed and completed before the press is operated. Records of inspections and maintenance shall be kept in accordance with paragraph (e) of this section.

1910.217(c)(3)(i)(b) -- Preventing the operator from inadvertently reaching into the point of operation, or withdrawing his hands if they are inadvertently located in the point of operation as the dies close.

The pull-out devices use a frame, cable, pulleys and/or gears to remove the operator's hands from the point of operation before the die closes. One end of the cable system attaches to the press slide or upper die. The cable then passes through the system of pulleys and/or gears, attached to the frame, and forks in such a way as to come out behind the operator station in two separate fixtures. The ends of the two cables that come out at the operator's station have a means of attaching to a harness that the operator wears around his/her wrist. The cables are adjusted to allow the operator to reach into the point of operation when the slide is in the top position. When the press is tripped and the slide moves downward, the cable pulls the operator's hands from the point of operation or, if the operator has already retracted his hands, the shortened cable prevents the operator from reaching into the point of operation until the slide approaches the top position at the end of the stroke.

c. Holdout or Restraint Device

1910.217(c)(3)(vi) -- A holdout or a restraint device shall protect the operator as specified in subdivision (i)(c) of this sub-paragraph and shall include attachments for each of the operator's hands. Such attachments shall be securely anchored and adjusted in such a way that the operator is restrained from reaching into the point of operation. A separate set of restraints shall be provided for each operator if more than one operator is required on a press.

1910.217(c)(3)(i)(c) -- Preventing the operator from inadvertently reaching into the point of

operation at all times.

The holdouts or restraint device uses a wrist harness, as does the pull out device, but the cables attached to the harness are fixed to a stand or frame behind the operator. Cables are long enough to permit the operators hands to be near the point of operation but never in the point of operation.

d. Two Hand Trip Device

1910.217(b)(6)(i) -- Two-hand trip. A two-hand trip shall have the individual operator's hand controls protected against unintentional operation and have the individual operator's hand controls arranged by design and construction and/or separation to require the use of both hands to trip the press and use a control arrangement requiring concurrent operation of the individual operator's hand controls.

1910.217(b)(6)(ii) -- Two-hand trip systems on full revolution clutch machines shall incorporate an anti-repeat feature.

1910.217(b)(6)(iii) -- If two-hand trip systems are used on multiple operator presses, each operator shall have a separate set of controls.

1910.217(c)(3)(viii)(a) -- When used in press operations requiring more than one operator, separate two-hand trips shall be provided for each operator, and shall be designed to require concurrent application of all operators' controls to activate the slide.

1910.217(c)(3)(viii)(b) -- Each two-hand trip shall meet the construction requirements of paragraph (b)(6) of this section.

1910.217(c)(3)(viii)(c) -- The safety distance (Dm) between the two-hand trip and the point of operation shall be greater than the distance determined by the following formula:

Dm - 63 inches/second X Tm; where:

Dm - minimum safety distance (inches);
63 inches/second - hand speed constant; and
Tm = the maximum time the press takes for the die closure after it has been tripped (seconds). For full revolution clutch presses with only one engaging point Tm

is equal to the time necessary for one
and one-half revolutions of the crankshaft.

For full revolution clutch presses with more than one engaging point, Tm shall be calculated as follows:

$$Tm = 1/2 + \frac{1}{\text{Number of engaging points per revolution}} \times \text{time necessary to complete one revolution of the crankshaft (seconds)}$$

The two-hand trip device depends on each operator having to use both hands to trip the full revolution press, and on palm buttons being far enough from the point of operation that once the press is tripped the operator can't remove a hand from the palm button and reach the point of operation before the press slide reaches the bottom of the stroke. The operator cannot be injured once the die closes or the press is in the upstroke. The operator depends on the single stroke mechanism being intact or a repeat stroke could catch his/her hand in the die.

The distance the palm buttons should be located from the point of operation is determined by how far the operator's hand can travel in the maximum length of time required for the slide to reach dead bottom (crankshaft at 180 degrees or 1/2 revolution from top). The maximum time for the slide to reach bottom is determined by the formula for Tm in the printing from OSH in Section 1910.217 (c)(3)(viii)(c).

It is important to stress the word maximum, with the time required for the slide to reach dead bottom after a full revolution clutch is tripped. This time will depend on the position of the flywheel when the clutch is tripped, as there are a number of engaging points on the interface of the flywheel that lock or engage with the clutch mechanism on the crankshaft causing a stroke. When the operator trips the press the clutch mechanism will "ride" the inter surface of the flywheel until the first engaging point on the flywheel comes by, and then the clutch will engage.

D. FULL REVOLUTION CLUTCH PRESSES

The following material deals with a suggested method of inspection of full revolution clutch presses.

Electrical Requirements & Accessories

1. Is the main power disconnect capable of being locked only in the "Off" position? 1910.217(b)(8)(i)

2. Is the motor start button protected against accidental operation? 1910.217(b)(8)(ii)

   Suggested Method to Comply: Ring guard

3. Will the drive motor starter disconnect the drive motor from the power source in the event of power source failure? 1910.217(b)(8)(iii)

   How to Inspect - Turn main power disconnect off, flip back on, if press continues to run, press is in violation.

   Suggested Method to Comply: Magnetic relay drop-out switch; Magnetic motor starters; Saf-Start-Plug

4. Does the single stroke mechanism operate properly? 1910.217(b)(3)(i)

   How to Inspect - Set controls on single stroke, operate tripping mechanism, continue to depress tripping mechanism, if press continues to run, press is in violation.

   Suggested Method to Comply:

   a. Check single stroke dog near flywheel may be disengaged (if provided).

   b. Interrupt the mechanical linkage to the clutch mechanism and insert an air cylinder to pneumatically "pull" the clutch mechanism. An electric foot switch or two electric palm buttons are used by the operator to trip the machine. When the operator actuates the electric tripping mechanism, an electrical control operates an air valve which provides compressed air to retract the air cylinder and trip the mechanical clutch mechanism. The electric control must provide an output that keeps the air cylinder retracted long enough for the clutch to engage, but not long enough for the crankshaft to make a complete revolution (which could result in double tripping). (See Page 81)

5. If used, are foot treadles protected against accidental operation? 1910.217(b)(4)(i)

6. Does the foot pedal have a nonslip surface? 1910.217 (b)(4)(ii)

   NOTE: The foot pedal shall have a nonslip contact area to prevent the operator from slipping, losing his balance, and reaching or falling into the point of operation as the machine strokes.

7. Are the pedal return springs of the compression type, operating on a rod or guided within a hole or tube, and designed to prevent interleaving of spring coils in the event of breakage? 1910.217(b)(4)(iii)

   NOTE: The spring requirements are to prevent spring breakage from interfering with normal operation of the spring in returning the pedal and preventing multiple strokes.

8. If pedal counterweights are provided, is the path of the weight enclosed? 1910.217(b)(4)(iv)

   NOTE: Sometimes counterweights are used rather than springs to pull the pedal back up. If counterweights are used, an enclosed path of travel reduces the possibility of something accidentally restricting the counterweight (such as an object getting under the counterweight) from returning the pedal and causing multiple strokes.

Point of Operation Safeguarding

NOTE: You have the option of using either a guard or a device for effectively safeguarding the point of operation of a mechanical power press. 1910.217(c)(1)(i)

Two-Hand Trips

1. Are two-hand trips, if used, protected against accidental operation? 1910.217(b)(6)(i)

2. Do two-hand trips require both hands concurrently to trip the press? 1910.217(b)(6)(i)

   NOTE: The "concurrent operation" of hand controls means that both palm buttons, etc., must be operated

before the press trips, but not that both must be actuated at the same instant. The operator may first press and hold one palm button, and then press the second button to trip the press.

3. Do two-hand trips incorporate a properly functioning anti-repeat feature? 1910.217(b)(6)(ii)

NOTE: The anti-repeat requirement is essentially the same as the single stroke requirement. Even if the operator holds both hand controls throughout the stroke, the press should stop after a single stroke. All hand controls must be released and again operated before the press can make another stroke.

4. If multiple operators are used, does each have a set of two-hand trips? 1910.217(c)(3)(viii)

5. Are the two-hand trips adjusted to the safety distance formula D = 63 inches/second x T? 1910.217(c)(3)(viii)

NOTE: Measure the safety distance from the closest pinch point to the two-hand trips (may be die blocks). For quick reference, use the chart on Page 82 after you have determined strokes per minute when running in continuous mode and also determine engaging points. (See 2 Examples of Formula, Pages 83 and 84.

Barrier Guards

1. If a guard is used for protection from the point of operation, does it conform to Table 0-10? 1910.217(c)(2)(i)

2. Does it utilize fasteners not readily removable by the operator? 1910.217(c)(2)(i)(d)

Pull Out Devices

1. If pull-out devices are used for protection from the point of operation, are the attachments connected to the press slide or upper die? 1910.217(c)(3)(iv)

How to Inspect - Inspect for frayed cables, worn gears and weakened attachment mechanisms.

2. If more than one operator is used on a press, is each operator provided with a pull-out device? 1910.217(c)(3)(iv)

3. Is each pull-out device inspected and adjusted at the start of each operator's shift, following a new die setup, and when operators are changed? 1910.217(c)(3)(iv)

   How to Inspect - Inspect pull-out or pull-backs for frayed cables, worn gears and weakened attachment mechanisms.

4. Are records maintained of inspections and maintenance? 1910.217(c)(3)(iv)

Movable Barriers

1. If a Type A movable barrier device or gate is used to protect the operator from the point of operation, does the press fail to operate when the gate does not fully close? 1910.217(c)(3)(i)(f)

   How to Inspect - WATCH (observe how gate operates), then place object (not hand) between the bottom edge of the gate and the frame or bolster pad. This will keep the gate from fully extending to the down position and the press should not stroke. If press strokes, the press is in violation of 1910.217(c)(3)(i)(f).

   Be sure no gap exists between the gate and the bolster pad when the gate is in the down position. If no bolster pad is used, a person may have his hand in the point of operation when the gate descends; and the gate may deflect his arm far enough to achieve the down position (which trips the press), but not far enough to displace hand or fingers from the point of operation. If a gate and bolster pad are incorrectly adjusted relative to each other, the gate could actually trap an arm and hold the operator's hand in the point of operation while instructing the machine to make a stroke.

   If the gates are driven downward by air pressure, the gate must be designed so that operator injury does not occur from the pinch point created between the bottom edge of the gate and the frame or bolster pad.

   All areas of access to the point of operation not guarded by the gate must be guarded with barrier guards.

   Suggested Method to Comply - The machine tripping device must be interlocked with the gate so that the press doesn't trip unless the gate is in the down position. This is usually accomplished by electrical or pneumatic

limit switches that close just as the gate reaches the down position. (This does not take the place of a single stroke mechanism.) The gate is either driven both up and down by an air cylinder, or uses gravity to fall and an air cylinder to drive it back up.

The gate should be padded and have sufficient width to spread the downward force over enough area of a persons' fingers or hands to prevent injury. Use an air regulator to control the air pressure to the cylinder, and thus the maximum downward force of the gate. The gate driven cylinder should be limited in cross-sectional areas so that failure or misadjustment of the air regulator to normal plant supply pressures (80-120 psi) does not cause the gate to develop injurious force. (These considerations do not apply to gates that use gravity down and air cylinder up operations.) A sensor on the bottom edge of the gate that reverses the gate if an obstruction is encountered on the way down is a most desirable feature.

2. If a Type B movable barrier device or gate is used to protect the operator from the point of operation, does the press fail to operate when the gate does not fully close? 1910.217(c)(3)(i)(g)

NOTE: Only the control functions are different for Type A and Type B gates. The mechanical construction of the gates are similar and the mechanical operational and design considerations for Type A apply to Type B gates.

Restraint Devices

1. If a restraint device is used to protect the operator from the point of operation, are attachments included for both of the operator's hands? 1910.217(c)(3)(vi)

2. Is the operator restrained from reaching into the point of operation? 1910.217(c)(3)(vi)

3. If multiple operators are used, is each operator provided with a set of restraints? 1910.217(c)(3)(vi)

Interlocked Barriers

1. If an interlocked barrier device is used to protect the operator from the point of operation, does the barrier conform to Table 0-10? (Page 80) 1910.217(c)(2)(iv)

2. Does the press fail to operate before the interlocked barrier is closed and conform to Table 0-10? (Page 80)

1910.217(c)(2)(iv)

Diesetting & Operating Procedures

1. Are hand tools used for freeing and removing stuck work or scrap? 1910.217(d)(1)(ii)

2. If a guide post creates a hazard, is it safeguarded the same as a point of operation hazard? 1910.217(d)(4)(i)

3. Are dies stamped with tonnage and stroke requirements, or are records of tonnage and stroke available to the diesetter? 1910.217(d)(6)(i)

4. Are dies stamped to indicate upper die weight, when necessary, for air counterbalance pressure adjustment? 1910.217(d)(6)(ii)

5. Are dies stamped to indicate complete die weight when handling equipment may be overloaded? 1910.217(d)(6)(iii)

6. Are dies securely mounted to the bolster and slide? 1910.217(d)(7)

7. Are equipment attachment points provided on dies requiring mechanical handling? 1910.217(d)(8)

8. Does the employer have written diesetting procedures? 1910.217(d)(9)(i) (See Pages 85-89)

9. Are spring-loaded turnover bars provided for presses which accept such turnover bars? 1910.217(d)(9)(ii)

10. Are die stops or other means provided to prevent losing control of the die while setting or removing dies in presses which are inclined? 1910.217(d)(9)(iii)

11. Are safety blocks used whenever dies are adjusted or repaired in the press? 1910.217(d)(9)(iv)

12. Does the employer provide brushes, swabs, lubricating rolls and automatic or manual guns so operators and diesetters are not required to reach into the point of operation or other hazard areas to lubricate material, punches, or dies? 1910.217(d)(9)(v)

Inspections

1. Are periodic and regular inspections performed to ensure that all parts, auxiliary equipment and

safeguards are in safe operating condition and adjustment? 1910.217(e)(1)(i)

2. Does the employer maintain a certification record of these inspections? 1910.217(e)(1)(i)

3. Does the certification record include the date of inspection, the signature of the person who performed the inspection and the serial number, or other identifier, of the power press that was inspected? 1910.217(e)(1)(i) (See Pages 90-96)

4. Is each press inspected and tested at least weekly to determine the condition of the anti-repeat future and the single-stroke mechanism? 1910.217(e)(1)(ii)

5. If the press is in violation of 1910.217(e)(1)(ii), is necessary maintenance or repair, or both, performed and completed before the press is operated? 1910.217(e)(1)(ii)

6. Does the employer maintain a certification record of these inspections, tests and maintenance work, which includes the date of inspection, tests or maintenance, the signature of the person who performed the inspection, test or maintenance, and the serial number or other identifier of the press that was inspected, tested or maintained? 1910.217(e)(1)(ii) (See Page 96)

Training of Maintenance Persons

1. Does the employer insure the original and continuing compliance of personnel caring for, inspecting, and maintaining power presses? 1910.217(e)(3)

Work Methods

1. Are operators trained and instructed in safe work methods of the mechanical power press? 1910.217(f)(2) (See Page 104)

2. Is sufficient clearance provided between machines so one operator's movement will not interfere with the work of another? 1910.217(f)(3)

3. Are surrounding floors in good condition and free of

obstructions, grease, oil and water? 1910.217(f)(3)

Reporting Procedures

1. Are reports of point of operation injuries made to the Kentucky Labor Cabinet, Occupational Safety and Health Program, within 30 days of the occurrence? 1910.217(g) (See Page 103)

E. PART REVOLUTION MECHANICAL POWER PRESS

1. Control and Operating Requirements

The clutch control of a part revolution clutch press are more sophisticated than that of a full revolution clutch machine. The clutch/brake mechanism is capable of stopping or starting the machine at any point in the stroke.

Some Ways to Tell a Part Revolution Clutch Press From a Full Revolution Clutch Press:

a. Air hose to clutch
b. Sophisticated controls
c. "Inch" on controls
d. Stop in midstroke

2. General Requirements for All Part Revolution Clutch Presses

1910.217(b)(7)(i) -- Machines using part revolution clutches. The clutch shall release and the brake shall be applied when the external clutch engaging means is removed, de-activated, or de-energized.

Springs are used to set the brake and release the clutch, in order for clutches to be self-releasing and brakes self-engaging.

1910.217(b)(7)(ii) -- A "red" color stop control shall be provided with the clutch/brake control system. Momentary operation of the stop control shall immediately de-activate the clutch and apply the brake. The stop control shall override any other control, and reactivation of the clutch shall require use of the operating (tripping) means which has been selected.

The emergency stop button must override all other controls and must stop the machine, even if the operator is telling the machine to "Go" with his palm buttons.

1910.217(b)(7)(iii) -- A means of selecting Off, "Inch", Single Stroke, and Continuous (when the continuous function is furnished) shall be supplied with the clutch/brake control to select type of operation of the press. Fixing of selection shall be by means capable of super-vision by the employer.

A main mode selection switch which can be key locked is the usual way of meeting this requirement.

1910.217(b)(7)(iv)(a) -- The "Inch" operating means shall be designed to prevent exposure of the workers hands within the point of operation by requiring the concurrent use of both hands to actuate the clutch, or

1910.217(b)(7)(iv)(b) -- Being a single control protected against accidental actuation and so located that the worker cannot reach into the point of operation while operating the single control.

A foot pedal does not comply with this requirement because a foot pedal is not stationary.

1910.217(b)(7)(i) -- Machines Using Part Revolution Clutches. The clutch shall release and the brake shall be applied when the external clutch engaging means is removed, de-activated, or de-energized.

1910.217(b)(7)(v) -- Two-hand controls for single stroke shall conform to the following requirements:

1910.217(b)(7)(v)(a) -- Each hand control shall be protected against unintended operation and arranged by design, construction, and/or separation so that the concurrent use of both hands is required to trip the press.

1910.217(b)(7)(v)(b) -- The control system shall be designed to permit an adjustment which will require concurrent pressure from both hands during the die

closing portion of the stroke.

1910.217(b)(7)(v)(c) -- The control system shall incorporate an anti-repeat feature.

1910.217(b)(7)(v)(d) -- The control systems shall be designed to require release of all operator's hand controls before an interrupted stroke can be resumed. This requirement pertains only to those single-stroke, two-hand controls manufactured and installed on or after August 31, 1971.

Ring guards are required and a separation of these controls by 22 inches or more will prevent operation by a hand and elbow.

Concurrent pressure means the operator must first push one button and then the other before the press will run. The press will not run until both buttons are pushed.

Concurrent pressure must be applied and maintained on the down stroke until the die opening is closed to less than 1/4 inch for single stroke operation.

The anti-repeat requirement means that the control stops the press at the end of each stroke.

The requirement that all operator's hand controls be released before an interrupted stroke can be resumed is useful as an anti-tiedown system.

Additional requirements in respect to safety distance must be met for two hand controls to qualify as a safety device as specified in 1910.217(c)(3)(vii).

1910.217(b)(7)(vii) -- Controls for more than one operating station shall be designed to be activated and deactivated in complete sets of two operator's hand controls per operating station by means capable of being supervised by the employer. The clutch/brake control system shall be designed and constructed to prevent actuation of the clutch if all operating stations are bypassed.

Each time an operator's station is bypassed, the press no longer requires an input to stroke. If all operators' stations are bypassed, the press will stroke unless provisions are made in the

control to prevent this possibility.

1910.217(b)(7)(viii) -- Those clutch/brake control systems which contain both single and continuous functions shall be designed so that completion of continuous circuits may be supervised by the employer. The initiation of continuous run shall require a prior action or decision by the operator in addition to the selection of Continuous on the stroking selector, before actuation of the operating means will result in continuous stroking.

Some control systems use a type of palm button that could be individually bypassed by a key, leaving the operator free to operate the press with a single palm button. Where multiple operator jobs are performed on a press, each operator must have a two palm button control station. Since not all operator stations may be used at all times, a means of deactivating both palm buttons with a single action on various operator stations must be provided.

Supervisory control over the number of active operator stations is absolutely necessary to ensure the required number of operator stations are not bypassed, leaving some operators without the necessity to have their hands occupied on the press downstroke.

One method for bypassing operator stations is that of key lock off/on selector switches located on the main control cabinet. Another system connects the operator station to the control with plug in cables. If the operator station is unplugged, the press will not stroke unless a "dummy" plug is inserted. Supervision is maintained by controlling the access to dummy plugs.

If all operator stations are bypassed, the press control would receive a signal to stroke unless special provisions are made in the control to prevent this possibility. The control must be designed to prevent the unexpected stroke that could result from someone inadvertently bypassing all operator stations, with attendant point of operation hazard.

1910.217(b)(7)(ix) -- If foot control is provided, the selection method between hand and foot control shall be separate from the stroking selector and

shall be designed so that the selection may be supervised by the employer.

1910.217(b)(7)(x) -- Foot operated tripping controls, if used, shall be protected so as to prevent operation from falling or moving objects, or from unintended operation by accidental stepping onto the foot control.

It is important that the supervisor or management have control over whether the foot pedal or two hand controls are used, to prevent the operator from using the foot pedal without proper point of operation guards or devices. The controls should automatically refuse to accept foot switch inputs when set on continuous and inch modes.

1910.217(b)(7)(xi) -- The control of air-clutch machines shall be designed to prevent a significant increase in the normal stopping time due to a failure within the operating valve mechanism, and to inhibit further operation if such failure does occur. This requirement shall apply only to those clutch/brake air-valve controls manufactured and installed on or after August 31, 1971, but shall not apply to machines intended only for continuous, automatic feeding applications.

Air valves are moving parts that shift to provide air pressure to actuate the clutch/brake system or to exhaust the system. Any mechanism with moving parts can fail, causing unintended strokes.

Dual air valves plus a monitor are, therefore, required. Monitors must be used with the dual air valve to prevent the control from providing a "go" signal to either valve mechanism, should one valve fail. If the valve failure monitor is not included, one valve could fail and the other could continue to operate the press normally, and when the second valve mechanism fails, unintended strokes or degraded stopping time is again the hazard. On presses intended only for continuous, automatic feeding operations, dual air valves plus a monitor are not required; however, for die setters the same hazard exists.

1910.217(b)(7)(xii) -- The clutch/brake control shall incorporate an automatic means to prevent initiation or continued activation of the Single Stroke or Continuous functions unless the press

drive motor is energized and in the forward direction. This provision will not prevent the employer from utilizing a reversing means of the drive motor with the clutch/brake control in the "Inch" position.

This requirement helps prevent "sticking" the slide on the bottom if the motor should stop and the flywheel lose speed. Many presses use reversing motor starters that can turn the flywheel in either direction of rotation. The reverse action is provided to "back" the slide up if it should "jam" on bottom. The Single Stroke and Continuous Modes use cam switch sequencing that depends on the press turning in the forward direction. The control would receive cam switch information in the reverse sequence and cause improper and hazardous operation if the clutch control could be energized while the motor turned in the reverse direction.

An exception to this requirement is provided for the "Inch" mode, to permit "dead motor inching". More precise control over the distance the slide moves with momentary actuation of the inch control is obtained if the motor is turned off and the flywheel allowed to coast to a reduced speed before inching. The clutch control does not depend on proper sequencing of the cam in the "Inch" mode and no hazard exists if the press should be run in the reverse direction.

1910.217(b)(7)(xiii) -- The clutch/brake control shall automatically deactivate in event of failure of the power or pressure supply for the clutch engaging means. Reactivation of the clutch shall require restoration of normal supply and the use of the tripping mechanism(s).

Failure of the clutch air pressure supply while the press is in the Continuous Mode could cause the press to stop stroking even though the clutch/brake control provides a signal to the air valve to activate the clutch. An operator or other person could not tell the difference between the control stopping the press and failure of the air pressure, and he/she could be injured if he/she entered the point of operation as the air pressure was restored and the press resumed stroking.

A method to abate this hazard is to provide an air pressure switch that opens, removing the power from the clutch/brake control, if the air pressure drops below a certain value. When the air pressure is restored to the control, the press may be restarted only after the operator reactuates his/her operator controls.

1910.217(b)(7)(xiv) -- The clutch/brake control shall automatically deactivate in event of failure of the counterbalance(s) air supply. Reactivation of the clutch shall require restoration of normal air supply and use of the tripping mechanism(s).

The mechanical requirement that the counterbalance not suddenly lose air pressure with air supply failure, means the slide stops with normal rapidity even if the air pressure is lost.

1910.217(b)(7)(xv) -- Selection of bar operation shall be by means capable of being supervised by the employer. A separate pushbutton shall be employed to activate the clutch, and the clutch shall be activated only if the driver motor is de-energized.

The Bar die setting mode required the worker to de-energize the press drive motor, actuate the clutch to connect the crankshaft to the flywheel, insert a bar (for leverage) into the slots in the flywheel, and turn the flywheel with the bar until the slide is close enough to attach the upper die. If the press drive motor should be energized while the worker was holding a bar inserted in the fly-wheel, injury could result as the motor spins the flywheel.

A keylock selector to activate the bar mode gives some supervisory control. An additional safety precaution can be taken by requiring the bar to be placed in a special compartment on the press. When in the compartment, the bar "makes" (closes) a limit switch that is interlocked with the motor control. If the bar is removed from the compart-ment, the limit switch opens, deactivating the drive motor.

3. Added Control Requirements for Part Revolution Presses With Hands in Die Operations

The revision to the power press standards in 1975 to permit hands in die operation, also added additional

requirements for press controls on machines using hands in die parts feeding and removal.

1910.217(c)(5) -- Additional requirements for safeguarding. Where the operator feeds or removes parts by placing one or both hands in the point of operation, and a two hand control, presence sensing device of Type B gate or movable barrier (on a part revolution clutch) is used for safeguarding:

1910.217(c)(5)(i) -- the employer shall use a control system and a brake monitor which comply with paragraphs (b)(13) and (14) of this section. This requirement shall be complied with by November 1, 1975;

1910.217(c)(5)(ii) -- the exception in paragraph (b)(7)(v)(d) of this section for two hand controls manufactured and installed before August 31, 1971 is not applicable under this paragraph (c)(5);

1910.217(c)(5)(iii) -- the control of air clutch machines shall be designed to prevent a significant increase in the normal stopping time due to a failure within the operating valve mechanism, and to inhibit further operation if such failure does occur, where a part revolution clutch is employed.

The exception in paragraph (b)(7)(xi) of this section for controls manufactured and installed before August 31, 1971, is not applicable under this paragraph (c)(5).

1910.217(b)(13) -- Control reliability. When required by paragraph (c)(5) of this section, the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system. This requirement does not apply to those elements of the control system which have no effect on the protection against point of operation injuries.

Control reliability -- failure in the control system shall not prevent normal stopping action from occur-

ring; and, successive strokes cannot be initiated unless the failure is cleared.

Reason -- The probability that two components will fail from independent causes within a press cycle is small. If a press control designed to (b)(13) standards experiences a single failure, a successive stroke cannot be initiated. The probability that a second failure will occur after the press is stopped, will void the control self-checking scheme and allow the press to run again before the first failure is discovered, is also small.

Failure of a control element occurs when the control element is in the wrong state at any time. (All press controls are based on two states: whether electromechanical (relays) or solid states are released on two status logic system). A relay contact is open or closed, a transformer voltage is high or low, etc.

To be self-checking three things are required:

1. Redundancy (basis for comparison)
2. Comparison
3. Exercises

Control reliability is required for hands in die operation on any part revolution power press whose point of operation guard or device depend on the control performing correctly and effective braking ability of the machine.

REMEMBER - The Type A gate stays closed until after the cycle is complete
The Type B gate raises before cycle is complete (raises on upstroke)

If a press control designed to (b)(13) standards experiences a single failure, a successive stroke cannot be initiated. Three things are required for control reliability:

a. Redundancy (i.e. two air valves)

b. Comparison (relay open/closed transistor voltage low-high)

c. Cycle which exercises each element to be checked to make certain that it is capable of providing both its logic states.

An example of the difference between two methods used to monitor the coupling of the rotary cam limit switch to the crankshaft should illustrate the difference between a system that meets the requirements of (b)(13) and one that does not. Rotary cam switch decoupling from the crankshaft is a serious hazard and one that occurs frequently. The single stroke hazard posed by decoupling comes when the cam switch becomes decoupled in the upstroke. The cam switch provides an input that "tells" the control to run automatically in the upstroke. Decoupling in the upstroke would result in the cam switch "telling" the control that the press was in the upstroke regardless of actual crankshaft position and the press would run continuously. The unexpected repeated stroking could result in amputation of hands and/or fingers.

To reduce this hazard, one method used involves mounting the rotary cam switch on a spring-loaded plate that is held in position that closes a limit switch as long as the chain connecting cam switch to crankshaft is intact. If the chain should break, the springs open the plate which opens the limit switch and removes power from the switch control. Two things are wrong with this system:

1. It does not protect against all decoupling failure modes. If the chain breaks, the monitor (if active) can detect the decoupling; however, if the cam switch fails to turn because the sprocket on its shaft slips, the chain still holds the limit switch closed and the failure is not detected.

2. The chain break limit switch does not have to demonstrate, on a cyclical basis, that it is capable of opening. The switch is <u>always</u> held in the <u>closed</u> position until the chain actually breaks. If the switch should fail in the <u>closed</u> position <u>before</u> the chain breaks, it doesn't prevent successive strokes from being initiated. When the chain does break the operator is not protected because the chain break limit switch failed first.

The second method which meets control reliability

standards is the use of a motion detector to monitor cam decoupling. The system uses a motion transducer which attaches to the cam switch shaft. The transducer produces an electrical signal when the cam switch rotates and the absence of a signal when the cam switch is motionless. The signal from the motion transducer is transmitted to the main motion detector circuit and supplied to the clutch/brake control in two places. First, the motion detector signal is provided to the clutch/brake control which requires the presence of a motion signal for the press to run in any automatic mode. Absence of a motion signal disables the automatic mode. The second place the motion detector is input to the control is in the interrupted stroke logic section. When the press stops, the absence of a motion signal is necessary before another stroke can be initiated.

1910.217(b)(13) also requires that control "failure be detectable by a simple test, or indicated by the control system". A maintenance person may void the self-checking aspects of the control by use of a jumper wire, rather than repairing the control when a single failure occurs, due to pressure to "get the machine running". A second failure may then cause the press not to stop, or to stroke when not intended. The requirement that the cause of the failure be easily found is to encourage maintenance personnel to repair any failure promptly.

1910.217(b)(14) -- Brake system monitoring. When required by paragraph (c)(5) of this section, the brake monitor shall meet the following requirements:

1910.217(b)(14)(i) -- Be so constructed as to automatically prevent the activation of a successive stroke if the stopping time or braking distance deteriorates to a point where the safety distance being utilized does not meet the requirements set forth in paragraph (c)(3)(iii)(e) or (c)(3)(vii)(c) of this section. The brake monitor used with the Type B gate or moveable barrier device shall be installed in a manner to detect slide top-stop overrun beyond the normal limit reasonably established by the employer.

1910.217(b)(14)(ii) -- Be installed on a press such that it indicates when the performance of the braking system has deteriorated to the extent described in paragraph (b)(14)(i) of this section.

1910.217(b)(14)(iii) -- Be constructed and installed in a manner to monitor brake system performance on each stroke.

A brake monitor is required on presses with hands in die operations, and which uses a guard or device which depend on the stopping time of the press to protect the operator.

A brake monitor is a part of the clutch brake control system which monitors the stopping performance of the brake. It prevents another stroke from being initiated, if the stopping time or stopping distance of the preceding stroke is greater than a preset time or distance. A Stop Time Measuring Device must be used by the installer, in order to preset the time or distance specified by the safety distance formula. Stopping time must be measured at 90 degree crankshaft angle.

Many factors which do affect stopping time must be considered. The least stopping time that can be obtained is the most desirable from a safety distance standpoint. Some of these factors are as follows:

Clutch/brake adjustment - This is important because as the clutch/brake surfaces wear, more air is stored in the clutch/brake mechanism; therefore, the clutch/brake travel greater distances to engage when the air valve pressurizes the system. Therefore, it takes the air valve longer to exhaust the stored air to a pressure that disengages the clutch and engages the brake. Also, the compression spring that sets the brake surface wears and the compression spring length with brake engaged gets longer.

Clutch air pressure should be regulated to the lowest pressure recommended by the manufacturer that allows the press to develop rated tonnage without slipping. The higher the pressure supplied the clutch/brake system the more air that will be stored in the clutch/brake mechanism, and the longer it will take for the

air valve to exhaust the system.

Heavier dies and their attachments - The weight of the die, as well as increased energy with greater mass in the ram, make it harder for the brake to stop the ram. It is important that part revolution clutch machines with counterbalances have the counterbalance properly adjusted for each die.

On presses with variable speeds of operation, increased speed makes it harder for the brakes to stop the press.

Brake temperature - Elevated brake temperatures may lower the stopping time relative to when the operation first started and the brake is cool. Type of brake linings are a major consideration, as well as foreign materials, such as oil and grease, which may be present on the brake linings.

Piping - Piping from the air valve to the clutch/ brake mechanism can also affect stopping time. Long pipe length introduces pneumatic "friction" into the system that delays exhaust, as do restrictive turns and fittings.

The three functional types of brakes monitors now used are:

1. Time Brake Monitor - The time base brake monitor compares the stopping time of the press with a preset time interval which is equal to or less than that allowed by the safety distance, Ds.

2. True Angular Distance Brake Monitor - The true angular distance brake monitor compares the angular stopping distance in terms of the number of degrees that the crankshaft rotates after electrical control "tells" the press to stop with a preset angular distance.

3. Top Stop Overrun Brake Monitors - The top stop overrun brake monitor checks the crankshaft position at the end of each stroke.

   It cannot be used to evaluate brake performance during stopping at the 90 degree downstroke

position, or any other angular position other than top of the stroke.

4. Point of Operation Guarding for Part Revolution Clutch Presses

a. Point of Operation Guards for Part Revolution Clutch Presses

Guards do not permit access into the point of operation at any time.

b. Point of Operation Devices for Part Revolution Clutch Presses

i. Type "A" Gate

"A" - stays closed until after stroke is completed.

"B" - raises before stroke is completed (raises on upstroke).

ii. Type "B" Gate or Movable Barrier

1910.217(c)(3)(ii) -- A gate or movable barrier device shall protect the operator as follows:

1910.217(c)(3)(ii)(b) -- A Type B gate or movable barrier device shall protect the operator in the manner specified in paragraph (c)(3)(i)(g) of this section.

1910.217(c)(3)(i)(g) -- Enclosing the point of operation before a press stroke can be initiated, so as to prevent an operator from reaching into the point of operation prior to die closure or prior to cessation of slide motion during the downward stroke.

Because Type "B" Gates open on the upstroke, it has a production advantage over a Type "A" Gate which must stay closed until the slide returns to the top of the stroke.

Only the control functions are different

on Type "A" and "B" gates, the mechanical construction, mechanical operation and design are basically the same.

iii. Presence Sensing Point of Operation Device

1910.217(c)(3)(iii) -- The presence sensing point of operation device shall protect the operator as provided in paragraph (c)(3)(i)(a) of this section, and shall be interlocked into the control circuit to prevent or stop slide motion if the operator's hand or other part of his body is within the sensing field of the device during the downstroke of the press slide.

1910.217(c)(3)(iii)(a) -- The device may not be used on machines using full revolution clutches.

1910.217(c)(3)(iii)(b) -- The devices may not be used as a tripping means to initiate slide motion, except when used in total conformance with paragraph (h) of this section.

1910.217(c)(3)(iii)(c) -- The device shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent the initiation of a successive stroke until the failure is corrected. The failure shall be indicated by the system.

1910.217(c)(3)(iii)(d) -- Muting (bypassing of the protective function) of such device, during the upstroke of the press slide, is permitted for the purpose of parts ejection, circuit checking and feeding.

1910.217(c)(3)(iii)(e) -- The safety distance (Ds) from the sensing field to the point of operation shall be greater than the distance determined by the following formula:

Ds = 63 inches/second x Ts where:

Ds = minimum safety distance (inches); 63 inches/second = hand speed constant; and Ts = stopping time of the press measured at approximately 90 degree position of crankshaft rotation (seconds).

1910.217(c)(3)(iii)(f) -- Guards shall be used to protect all areas of entry to the point of operation not protected by the presence sensing device.

The presence sensing device (P.S.D.) scans access to the point of operation and sends a "stop" signal to the clutch/brake control if the sensing field is entered by an object. The P.S.D. will not allow the machine to initiate a stroke if an object is in the sensing field, or stops a stroke that is in progress, if an object enters the sensing field.

Prior to June, 1988 OSHA did not allow presence sensing device initiation.

History

Presence Sensing Device Initiation (P.S.D.I.) was introduced in West Germany, in 1953. In the U.S.A. the 1971 revision of the American National Standards Institute Voluntary Consensus standards ANSI B11.1, "Safety Requirements for Construction, Care and Use of Mechanical Power Presses", permitted the use of P.S.D.'s as safeguards to stop the press if the employee placed part of his/her body in the point of operation during the stroke.

However, the standard prohibited their use as a tripping means to initiate the press cycle. OSHA adopted the ANSI standard in its entirety as a Federal Regulation (29 CFR 1910.217, in 1971).

OSHA granted a variance permitting the use of P.S.D.I. on an experimental basis to the Interlaking Stamping Corporation of Willoughby, Ohio, on August 31, 1976. A light curtain type presence sensing device was used to function as a combined safe-guard and tripping mechanism on five (5) open back inclined mechanical power presses at the Interlake plant.

In nearly a decade of continuous, carefully monitored use at Interlake, there has been no injuries in P.S.D.I. equipped presses.

Therefore, it is concluded that the use of P.S.D.I. is safe and contributes to greater productivity and operator fatigue.

Reasons for These Conclusions are:

1. The operator is protected just as well with P.S.D.I. as with stroke initiation methods.

2. In addition to the operator, P.S.D. protects all others who intrude into the point of operation, as opposed to pull-outs, two hand controls and restraints.

3. Personnel who violate 1910.217(d)(1)(ii) by attempting to remove scrap or stuck parts with their hands are also protected.

4. The overall press and control system safety are enhanced by certification and related requirements to ensure a higher degree of equipment capability and reliability, than was provided by the former standard. (Test rods to ensure object sensitivity, inspection and maintenance, any condition of failure, noncompliance or improper adjustment must be corrected before press can operate, set at each die change or have a fixed position to provide required safety distance, interlocked with supplementary guards or supple-mentary light curtains, initial and periodical training, third party certification.)

5. Less operator fatigue.

6. More strict training for maintenance persons.

7. Press cannot be operated unless press is P.S.D.I. mode.

8. P.S.D.I. do not have to be removed at the completion of a stroke to gain access to the point of operation.

9. Do not physically obstruct other operators.

Those For and Against P.S.D.I.

	For	Against
Press Users	32	0
Device Manufacturers	20	0
Press Manufacturers	11	4
Trade Associations	3	3
Consultants	3	2
Government Agencies	4	0
Insurance Companies	2	1
Unions	0	2
Others	2	0

When P.S.D.'s are used, control reliability, as specified in 1910.217(b)(13), is required.

The P.S.D. may be muted on the upstroke.

A brake monitor which complies with 1910.217(b)(14) must be used with P.S.D., dual air valves with a monitor is also required.

P.S.D. must be located at a safe distance from the point of operation, which will allow the press to stop before the operator's hand can reach through the sensing field. All areas of access to the point of operation, not protected by the P.S.D., must be protected by

barrier guards.

The Three Types of P.S.D.'s are:

1. Visible light fields.

2. Infrared light fields.

3. Capacitance fields or radio frequency.

Both visible and infrared light P.S.D. can use retroflectors to reflect light back to a common transmitter/receiver. The interruption of light from a light source to a photosensitive receiver is the indication of the presence of an object. Since light travels in a direct line, a shapely defined field may be created.

The capacitance field devices use conduit or other material to form "antensors" that surround access to the point of operation. The capacitance field can be affected by configuration of objects near the machine (bins, tables), may be adjusted out of detection range and must be adjusted for the individual who operates the machine (large person/ small person). There is no way to tell if the capacitance field will perform its function except by the fact that it does sense the object once the object has intruded.

iv. Pull Out Device

1910.217(c)(3)(iv) -- The pull-out device shall protect the operator as specified in paragraph (c)(3)(i)(b) of this section, and shall include attachments for each of the operators' hands.

1910.217(c)(3)(iv)(a) -- Attachments shall be connected to and operated only by the press slide or upper die.

1910.217(c)(3)(iv)(b) -- Attachments shall be adjusted to prevent the operator from

reaching into the point of operation or to withdraw the operator's hands from the point of operation before the dies close.

1910.217(c)(3)(iv)(c) -- A separate pull-out device shall be provided for each operator if more than one operator is used on a press.

1910.217(c)(3)(iv)(d) -- Each pull-out device in use shall be visually inspected and checked for proper adjustment at the start of each operator shift, following a new die set-up, and when operators are changed. Necessary maintenance or repair, or both, shall be performed and completed before the press is operated. Records of inspections and maintenance shall be kept in accordance with paragraph (e) of this section.

The application of the pull-out device and the restraint device is similar either for full or part revolution clutch presses.

v. Two Hand Control Device

1910.217(c)(3)(vii) -- The two-hand control device shall protect the operator as specified in paragraph (c)(3)(i)(e) of this section.

1910.217(c)(3)(vii)(a) -- When used in press operations requiring more than one operator, separate two hand controls shall be provided for each operator, and shall be designed to require concurrent application of all operators' controls to activate the slide. The removal of a hand from any control button shall cause the slide to stop.

1910.217(c)(3)(vii)(b) -- Each two hand control shall meet the construction requirements of paragraph (b)(7)(v) of

this section.

1910.217(c)(3)(vii)(c) -- The safety distance (Ds) between each two hand control device and the point of operation shall be greater than the distance determined by the following formula:

Ds = 63 inches/second X Ts; where: Ds = minimum safety distance (inches); 63 inches/second = hand speed constant; and Ts = stopping time of the press measured at approximately 90 degree position of crankshaft rotation (seconds).

1910.217(c)(3)(vii)(d) -- Two hand controls shall be fixed in position so that only a supervisor or safety engineer is capable of relocating the controls.

The construction and functional requirements for two hand control devices are the same as two hand trips. For two hand controls to be used as a point of operation device, check the following:

1. Properly located (Stop time measuring device must be used).

2. Separate controls for each operator.

3. If operator feeds or removes the part by hand (b)(13) and (b)(14) plus release of all operator's hand controls and reactivation and dual air valves with a monitor are required.

F. PART REVOLUTION CLUTCH PRESSES

The following material deals with a suggested method of inspection of part revolution clutch presses.

Electrical Requirements & Accessories

1. Is the main power disconnect capable of being locked only in the "Off" position? 1910.217(b)(8)(i)

2. Is the motor "start" button protected against accidental operation? 1910.217(b)(8)(ii)

3. Will the drive motor starter disconnect the drive motor from the power source in the event of a power source failure? 1910.217(b)(8)(iii)

4. Do spring counterbalance systems incorporate a means to retain system parts in the event of breakage? 1910.217(b)(9)(i)

   NOTE: Spring on a rod guided by an attachment to the crown (top member of the press frame) and attached to the slide.

5. Do air counterbalance systems incorporate a means to prevent sudden loss of pressure in the event of an air supply failure? 1910.217(b)(9)(v)

   How to Inspect - Reduce the air supply to the air counterbalance. If the press continues to operate, the press is in violation.

   Suggested Method to Comply - Install a check valve that permits air to flow into the air cylinder from the supply, but permits air from flowing out of the cylinder.

6. Does the counterbalance air supply incorporate a pressure switch to automatically deactivate the clutch/brake control in the event of an air supply failure? 1910.217(b)(7)(xiv)

   How to Inspect - Reduce the air supply to the air counterbalance. If the slide does not stop with normal rapidity, even as the air pressure is lost, the press is in violation.

7. Does air controlling equipment have a means to filter foreign material and water from the pneumatic system? 1910.217(b)(10)

8. Is a "Red" colored stop button provided? 1910.217(b)(7)(ii)

9. Does the "Red" colored stop button override all other controls? 1910.217(b)(7)(ii)

10. Is a means of selecting "Off", "Inch", "Single-Stroke" and "Continuous" (when the "Continuous" function is furnished) supplied to select operation of the press? Fixing of selection shall be capable of supervision by the employer. 1910.217(b)(7)(iii)

Suggested Method to Comply - Provide a key locked main mode selector switch with adequate supervision.

11. Does the "Inch" operation require the use of both hands or is a single control located in such a place so the worker cannot reach into the point of operation? 1910.217(b)(7)(iv)

    NOTE: Be sure the press will not accept footswitch inputs when the mode selector switch is turned to "inch".

12. Does switching from "Single-Stroke" to "Continuous" require a prior action by the operator in addition to the selection of "Continuous" on the stroking selector? 1910.217(b)(7)(viii)

    Suggested Method to Comply - "Continuous" set-up push buttons may be used, that must be actuated within a few seconds before pushing the palm buttons, to initiate continuous stroking.

13. Is the selector for "hand" or "foot" control separate from the stroking selector and designed so that the selection may be supervised by the employer? 1910.217(b)(7)(ix)

    How to Inspect - The press should automatically refuse to accept foot switch inputs in Inch and Continuous modes.

    Suggested Method to Comply - Provide mode selector switch for hand and foot controls that can be key locked, with adequate supervision.

14. Are foot controls protected against accidental operation? 1910.217(b)(7)(x)

15. Does the clutch/brake air supply incorporate a pressure switch to deactivate the clutch/brake control in the event of a failure of the air pressure supply for the clutch engaging means? 1910.217(b)(7)(xiii)

    How to Inspect - Reduce the air pressure supply for the clutch. If the press continues to operate, the press is in violation. When the air pressure is restored, the power is restored to the control and the press may be restarted only after the operator reactivates his operator's controls.

Suggested Method to Comply - Install an air pressure switch that opens, removing the power from the clutch/brake control, if the clutch air supply drops below a certain value.

16. Is the press equipped with dual air valves and a monitor for single stroke operation? 1910.217(b)(7)(xi) and 1910.217(b)(8)(vi).

Point of Operation Safeguarding

NOTE: You have the option of using either a guard or a device for effectively safeguarding the point of operation of a mechanical power press. 1910.217(c)(1)(i)

Barrier Guards

1. If a barrier guard is used for protection from the point of operation, does it conform to Table 0-10? (Page 80) 1910.217(c)(2)(i)

2. Does the barrier guard utilize fasteners not readily removable by the operator? 1910.217(c)(2)(i)(d)

Presence Sensing Devices

1. If a presence sensing device is used for protection from the point of operation, does it cause a cessation of slide motion if part of the operator's body enters the sensing field? 1910.217(c)(3)(iii)

2. If a presence sensing device is used as a tripping mechanism, does the presence sensing device conform to the requirements as specified in 1910.217(h)?

3. Is the presence sensing device used on a full revolution clutch press? 1910.217(c)(3)(iii)(a) and 1910.217(h)(iii)

4. Is the device adjusted to the safety distance formula D = 63 inches/second x T? 1910.217(c)(3)(iii)

   How to Inspect - A Stop Time Measuring Device must be used.

5. Are guards used to protect all areas of entry to the point of operation not protected by the presence sensing device? 1910.217(c)(3)(iii)

6. If the operator must place one or both hands in the point of operation, has a brake monitor and a reliable

control system been installed? 1910.217(c)(5)(i)

NOTE: The operator will place one or both hands in the point of operation when the following devices are used as a point of operation safeguard:

a. Presence sensing device
b. Type B gates or movable barrier device
c. Two-hand controls

Some items you can physically see in reference to control reliability

a. Dual air valve with monitor
b. Motion detector to monitor cam decoupling
c. The failure must be detected by a simple test, or indicated by the control system. (Normally see a red, green or amber lights on control for this.)
d. Get name, model number on control box and call manufacturer, provided control box has not been modified.

Brake Monitor

How to Inspect - look for box which says "Brake Monitor". Ask for manufacturer's booklet on brake monitor, as there are three (3) functional types of brake monitors now used. These are:

a. Time Base Brake Monitor
b. True Angular Distance Brake Monitor
c. Top Stop Overrun Brake Monitor

NOTE: The Top Stop Overrun Brake Monitor cannot ensure compliance with the safety distance formula and does not comply with OSH.

Pull-Out Devices

1. If pull-out devices are used for protection from the point of operation, are the attachments connected to the press slide or upper die? 1910.217(c)(3)(iv)

   How to Inspect - Look for frayed cables, worn gears and weakened attachment mechanisms.

2. If more than one operator is used on a press, is each operator provided with a pull-out device?

1910.217(c)(3)(iv)

3. Is each pull-out device inspected and adjusted at the start of each operator shift, following a new die setup, and when operators are changed? 1910.217(c)(3)(iv)

4. Are records maintained of inspections and maintenance? 1910.217(c)(3)(iv)

Movable Barriers

1. If a Type A movable barrier device or gate is used to protect the operator from the point of operation, does the press fail to operate when the gate does not close fully? 1910.217(c)(3)(i)(f)

2. If a Type B movable barrier device or gate is used to protect the operator from the point of operation, does the press fail to operate when the gate does not close fully? 1910.217(c)(3)(i)(g)

3. If a Type B movable barrier device or gate is used to protect the operator from the point of operation, and the operator must place one or both hands in the point of operation, has a brake monitor and a reliable control system been installed? 1910.217(c)(5)(i)

Restraint Devices

1. If a restraint device is used to protect the operator from the point of operation, are attachments included for both of the operator's hands? 1910.217(c)(3)(vi)

2. Is the operator restrained from reaching into the point of operation? 1910.217(c)(3)(vi)

3. If multiple operators are used, is each operator provided with a set of restraints? 1910.217(c)(3)(vi)

Interlocked Barrier Devices

1. If an interlocked barrier device is used to protect the operator from the point of operation, does the barrier conform to Table 0-10? (Page 80) 1910.217(c)(2)(iv)

2. Does the press fail to operate before the interlocked barrier is closed and conform to Table 0-10? (Page 80) 1910.217(c)(2)(iv)

Two-Hand Control Devices

1. If two-hand controls are used to protect the operator from the point of operation, is each hand control protected against unintended operation? 1910.217(b)(7)(v)(a)

   Suggested Method to Comply - Surround by ring guards.

2. Are the two-hand controls arranged by design, construction, and/or separation so that the concurrent use of both hands is required to trip the press? 1910.217(b)(7)(v)(a)

   Suggested Method to Comply - Separate buttons by 22 inches or more.

   How to Inspect - Be sure buttons cannot be activated with an elbow and a hand, or any other means other than the intended two-handed function.

   Concurrent Use of Both Hands

   Suggested Method to Comply - Adjust rotary cam switch (or equivalent rotary position indicator).

   How to Inspect - Apply pressure on the two-hand controls release. If the press continues to operate, the press is in violation.

3. Does the system incorporate an anti-repeat feature? 1910.217(b)(7)(v)

4. Does the anti-repeat feature operate properly? 1910.217(b)(7)(v)

   How to Inspect - Be sure the control system is set on "single stroke", depress and hold two-hand controls down. If press continues to operate, press is in violation.

   Suggested Method to Comply - Install a rotary cam switch which provides a signal to stop the press as the top of the stroke is approached.

5. If multiple operators are used, is each provided with a set of two-hand controls? 1910.217(c)(3)(vii)

6. Are the controls adjusted to the safety distance formula D - 63 inches/second x T? 1910.217(c)(3)(viii)

   How to Inspect - Stop Time Measuring Device must be

used.

7. If the operator must place one or both hands in the point of operation, is a brake monitor and a reliable control system installed? 1910.217(c)(5)(i)

8. Are the controls fixed in position so that only the supervisor or safety engineer is capable of relocating the controls? 1910.217(c)(3)(vii)

Diesetting & Operating Procedures

1. Are hand tools used for freeing and removing stuck work or scrap? 1910.217(d)(1)(ii)

2. If a guide post creates a hazard, is it safeguarded the same as a point of operation hazard? 1910.217(d)(4)(i)

3. Are dies stamped with tonnage and stroke requirements, or are records of tonnage and stroke available to the diesetter? 1910.217(d)(6)(i)

4. Are dies stamped to indicate upper die weight when necessary for air counterbalance pressure adjustments? 1910.217(d)(6)(ii)

5. Are dies stamped to indicate the complete die weight when handling equipment may be overloaded? 1910.217(d)(6)(iii)

6. Are dies securely mounted to the bolster and slide? 1910.217(d)(7)

7. Are equipment attachment points provided on dies requiring mechanical handling? 1910.217(d)(8)

8. Does the employer have written diesetting procedures? 1910.217(d)(9)(i) (See Pages 85-89)

9. Are spring-loaded turnover bars provided for presses which accept such turnover bars? 1910.217(d)(9)(ii)

10. Are die stops or other means provided to prevent losing control of the die while setting or removing dies in presses that are inclined? 1910.217(d)(9)(iii)

11. Are safety blocks used whenever dies are adjusted or repaired in the press? 1910.217(d)(9)(iv)

12. Does the employer provide brushes, swabs, lubricating rolls and automatic or manual guns so operators and diesetters are not required to reach into the point of operation or other hazard areas to lubricate material, punches or dies? 1910.217(d)(9)(v)

Inspections

1. Are periodic and regular inspections performed to ensure that all parts, auxiliary equipment and safeguards are in safe operating condition and adjustment? 1910.217(e)(1)(i)

2. Does the employer maintain a certification record of these inspections? 1910.217(e)(1)(i)

3. Does the certification record include the date of inspection, the signature of the person who performed the inspection and the serial number, or other identifier, of the power press that was inspected? 1910.217(c)(1)(i) (See Page 96)

4. Is each press inspected and tested at least weekly to determine the condition of the anti-repeat future and the single-stroke mechanism? 1910.217(e)(1)(ii)

5. If the press is in violation of 1910.217(e)(1)(ii), is necessary maintenance or repair, or both, performed and completed before the press is operated? 1910.217(e)(1)(ii)

6. Does the employer maintain a certification record of these inspections, tests and maintenance work, which includes the date of inspection, tests or maintenance, the signature of the person who performed the inspection, test or maintenance, and the serial number, or other identifier of the press that was inspected, tested or maintained? 1910.217(e)(1)(ii) (See Page 96)

Training of Maintenance Persons

1. Does the employer insure the original and continuing compliance of personnel caring for, inspecting, and maintaining power presses? 1910.217(e)(3)

Work Methods

1. Are operators trained and instructed in safe work methods of mechanical power presses? 1910.217(f)(2)

2. Is sufficient clearance provided between machines so one operator's movement will not interfere with the work of another? 1910.217(f)(3)

3. Are surrounding floors in good condition and free of obstructions, grease, oil and water? 1910.217(f)(3)

Reporting Procedures

1. Are reports of point of operation injuries made to the Kentucky Labor Cabinet, Occupational Safety and Health Program, within 30 days of occurrence? 1910.217(g)

G. DESIGN CONSTRUCTION SETTING AND FEEDING DIES

1910.217(d)(1)(i) -- Design, construction, setting and feeding of dies. (General Requirements) - Effective February 1, 1975, the employer shall use dies and operating methods designed to control or eliminate hazards to operating personnel, and

1910.217(d)(1)(ii) -- furnish and enforce the use of hand tools for freeing and removing stuck work or scrap pieces from the die, so that no employee need reach into the point of operation for such purposes. (17% of injuries in 1986)

1910.217(d)(3) -- Scrap handling. The employer shall provide means for handling scrap from roll feed or random length stock operations. Scrap cutters used in conjunction with scrap handling systems shall be safeguarded in accordance with paragraph (c) of this section and with §1910.219.

1910.217(d)(4) -- Guide post hazard. The hazard created by a guide post (when it is located in the immediate vicinity of the operator) when separated from its bushing by more than one-fourth inch shall be considered as a point of operation hazard and be protected in accordance with paragraph (c) of this section.

1910.217(d)(5) -- Unitized tooling. If unitized tooling is used, the opening between the top of the punch holder and the face of the slide, or striking pad, shall be safeguarded in accordance with the requirements of paragraph (c) of this

section.

1910.217(d)(6)(i) -- Tonnage, stroke and weight designation. All dies shall be stamped with the tonnage and stroke requirements, or have these characteristics recorded if these records are readily available to the die setter;

1910.217(d)(6)(ii) -- Stamped to indicate upper die weight when necessary for air counterbalance pressure adjustment; and

1910.217(d)(6)(iii) -- Stamped to indicate complete die weight when handling equipment may become overloaded.

1910.217(d)(8) -- Die handling. Handling equipment attach points shall be provided on all dies requiring mechanical handling.

1910.217(d)(9)(i) -- Diesetting. The employer shall establish a diesetting procedure that will insure compliance with paragraph (c) of this section.

1910.217(d)(9)(ii) -- The employer shall provide spring loaded turnover bars, for presses designed to accept such turnover bars.

1910.217(d)(9)(iii) -- The employer shall provide press stops or other means to prevent losing control of the die while setting or removing dies in presses which are inclined.

1910.217(d)(9)(iv) -- The employer shall provide and enforce the use of safety blocks for use whenever dies are being adjusted or repaired in the press.

1910.217(d)(9)(v) -- The employer shall provide brushes, swabs, lubricating rolls, and automatic or manual pressure guns so that operators and diesetters shall not be required to reach into the point of operation or other hazard areas to lubricate material, punches or dies.

H. INSPECTION AND MAINTENANCE OF PRESSES

1910.217(e)(1)(i) -- Inspection, maintenance, and

modification of presses - (Inspection and maintenance records). It shall be the responsibility of the employer to establish and follow a program of periodic and regular inspections of his power presses to insure that all their parts, auxiliary equipment, and safeguards are in safe operating condition and adjustment. The employer shall maintain records of these inspections and the maintenance work performed.

1910.217(e)(1)(ii) -- Each press shall be inspected and tested no less than weekly to determine the condition of the clutch/brake mechanism, anti-repeat feature and single stroke mechanism. Necessary maintenance or repair or both shall be performed and completed before the press is operated. The employer shall maintain records of these inspections and the maintenance work performed. These requirements do not apply to those presses which comply with paragraphs (b)(13) and (14) of this section.

I. OPERATION OF POWER PRESSES

1910.217(f)(2) -- Instruction to operators. The employer shall train and instruct the operator in the safe method of work before starting work on any operation covered by this section. The employer shall insure by adequate supervision that correct operating procedures are being followed.

1910.217(f)(3) -- Work area. The employer shall provide clearance between machines so that movement of one operator will not interfere with the work of another. Ample room for cleaning machines, handling material, work pieces, and scrap shall also be provided. All surrounding floors shall be kept in good condition and free from obstructions, grease, oil and water.

1910.217(f)(4) -- Overloading. The employer shall operate his presses within the tonnage and attachment weight ratings specified by the manufacturer.

J. REPORTS OF INJURY TO EMPLOYEES OPERATING MECHANICAL POWER PRESSES

1910.217(g) -- The employer shall, within 30 days of the occurrence, report to either the Director of the Office of Standards Development, OSHA, U.S. Department of Labor, Washington, D.C., 20210, or the State agency administering a plan approved by the Assistant Secretary of Labor for Occupational Safety and Health, all point of operation injuries to operators or other employees. The following information shall be included in the report:

1910.217(g)(i) -- Employer's name, address and location of the workplace (establishment).

1910.217(g)(ii) -- Employee's name, injury sustained, and the task being performed (operation, set-up, maintenance, or other).

1910.217(g)(iii) -- Type of clutch used on the press (full revolution, part revolution, or direct drive).

1910.217(g)(iv) -- Type of safeguard(s) being used (two hand control, two hand trip, pull outs, sweeps, or other). If the safeguard is not described in this section, give a complete description.

1910.217(g)(v) -- Cause of the accident (repeat of press, safeguard failure, removing stuck part or scrap, no safeguard provided, no safeguard in use, or other).

1910.217(g)(vi) -- Type of feeding (manual with hands in dies or with hands out of dies, semi-automatic, automatic, or other).

1910.217(g)(vii) -- Means used to actuate press stroke (foot trip, foot control, hand trip, hand control, or other).

1910.217(g)(viii) -- Number of operators required for the operation and the number of operators provided with controls and safeguards.

III. PRESS BRAKES

A. TYPES OF PRESS BRAKES

Press Brakes are machines which have a long, narrow bed, usually supported by "C" form frames on the end of the bed and slide (slides mech/air and hyd. press brakes).

The Three Types of Drive Systems on Air Brakes are:

1. Friction clutch press brake with clutch applied and brakes released by an operator's foot treadle through a mechanical linkage.

2. Air clutch press brake with air released spring returned brakes.

3. Hydraulic press brake uses hydraulic pumps which provide hydraulic pressure to drive the slide up and down.

B. APPLICATION OF PRESS BRAKES

Press brakes are used to form a variety of operations on sheet or plate metals which include bending, piercing and straightening operations.

Bending is the primary operation used to form angles, flanges (long narrow dies, simple shape used).

Generally, the part to be formed is held in place by the operator's hands while the operator activates a mechanical foot treadle or electrical foot switch to control the slide motion. The part is laid across the lower part of the die as the vertical support. When the upper part of the die contacts the material, the portion of the material protruding from the front of the machine must follow the forming (dies are designed so that the front protruding material moves upward as the part is formed) action of the die. The operator continues holding the part and follows the forming action with his hands.

When small parts are held close to the die by the operator, both the point of operation hazard and pinch point hazard, between the part and upper die, may be present. When large parts are formed, the operator must support the material at some distance from the die. The part of the material extended in front of the press will "whip" upward faster than the operator can support the material if the slide moves too fast when forming the part. This is the reason that ways to slow form the part are usually required on press brakes.

The press brake is sometimes used to pierce holes with unitized tooling; holes are usually pierced in flat sheets of material. The sheet metal that

extends from the die area does not move as holes are pierced because no forming action occurs. Thus, slow forming is not needed.

Straightening or rolling steel plate is an operation sometimes performed by press brakes. The material is laid across the lower part of the die and held in position by the operator. The upper part of the die has a blunt shape. The shut height of the press brake is adjusted so as not to close the die, but to press the material hard enough to remove existing, undesired curvature in the plate, or to slightly curve the material. Unless sharp curves are formed, normal speed of the slide may be used in these operations.

Special fabricated dies are sometimes used which allows the press brake to be used as a power press. The press brake then functionally becomes a power press and should be subject to 1910.217 regulations.

C. SAFEGUARDING THE POINT OF OPERATION ON PRESS BRAKES

1. General Considerations

OSHA has no specific press brake standards. ANSI has adopted standards for press brakes which are similar to that of a power press.

Fixed barrier guards can be used when piercing is performed on sheet metal, with unitized tooling, by leaving openings in the guard large enough for the material to pass through, but small enough to prevent entry of hands and/or fingers.

The back must also be guarded/chains interlocked barriers, etc.

2. Methods to Safeguard Friction Clutch Mechanical Treadle Machines

a. Type "B" Gates - close prior to clutch activation, raises on upstroke before cycle complete.

Two operating cycles are possible for the Type "B" Gate when used as guards for press brakes. The first cycle is used for parts that are flat sheets before the forming

occurs and that protrude far enough from the front of the die that the gate can come down between the operator and the die.

How the First Cycle Operates:

i. Operator inserts part between dies and locates it on the gaging system.

ii. Operates foot switch or treadle to bring gate down on projecting material.

iii. Activates clutch.

iv. When die closes sufficiently to contact material, gate must retract quickly to avoid contact with the upward arc of the part as it is formed.

v. Part formed, slide returns to top.

How the Second Cycle Operates:

i. Operator operates foot switch or treadle to a bolster or table to completely enclose the point of operation.

ii. Operator uses foot switch or treadle to bring gate down to an opening of 1/4 inch or less at which time gate goes back up. (Part Cycle)

iii. Insert part, resume stroke, part formed, slide returned to top.

When using a Type "B" Gate, the linkage between the treadle and the clutch must be modified to prevent the treadle from actuating the clutch until the gate is down, or the treadle may be replaced with an electric or air foot pedal which controls actuation of the clutch through a mechanism that pulls the clutch linkage.

b. Two Hand Controls Down - Foot Switch Up

Two hand controls are used for a point of operation device on a press brake on the downstroke until the opening between the dies is 1/4 inch or less. The controls then deactivate the hand controls and actuate a foot switch. The operator then inserts and locates the part and completes the cycle by actuating the clutch with an electric foot switch. Safety distance for this method must be calculated.

c. Presence Sensing Device

The presence sensing device uses light beams to scan across the point of operation and send a stop signal to the clutch/brake system when an object intrudes upon the point of operation. The presence sensing device depends on the stopping time of the press to protect the operator; therefore, the clutch/brake mechanism must be revised to respond to stop signals other than the foot treadle, and a control must be added to supervise the clutch/brake output now that multiple inputs are present. These controls must be designed to control reliability standards, brake monitoring and retains the ability to slip the clutch. Several companies sell packages which contain both the full cycle and the part cycle mode.

d. Restraints

Restraints will allow the operator to hold small pieces near the die, or to follow the bending action of large pieces supported by the hands. Care must be taken when forming or bending large pieces to ensure that the restraints do not hinder the operator's manipulation of the material toward the die in the feeding process or that the material doesn't become entangled in the restraints. Close supervision is a must to ensure proper use of restraints.

3. Methods Used for Safeguarding the Air Clutch Press Brake

Each device used for safeguarding the point of operation on the mechanical friction clutch machine is much easier to apply to the air clutch machine, because air clutch press brakes already have the electrical controls needed to install Type "B" Gates, two hand controls and the presence sensing device. The clutch/brake control may need to be replaced with controls which have both the full and part cycle modes of operation. A brake monitor should be added when a presence sensing device or two hand controls are used. If the machine has a single air valve, it should be replaced with a dual air valve with a monitor.

4. Methods for Safeguarding Hydraulic Press Brakes

Hydraulic press brakes function similar to the mechanical press brake; however, these machines have no clutch or brake. Hydraulic pressure moves the slide up and down. Most hydraulic press brakes have two speeds to provide for fast and slow forming modes. Some hydraulic press brakes also have both the full and the part cycle mode of operation. The machine stops by blocking hydraulic parts and usually has a short stopping time.

Some old hydraulic press brakes may not have an electrical system that is adaptable to point of operation devices that interface with the control. Modifications or replacement of these controls may be required if Type "B" Gates, two hand controls or presence sensing devices are to be applied.

A P P E N D I C E S

DEFINITIONS

*Words enclosed in parenthesis within this definition are meant to clarify.

**Explanation - Antirepeat refers to the electrical system. Cost approximately $2,000. Not needed on a full revolution clutch mechanical power press, single stroke normally used on full revolution clutch mechanical power presses. A single stroke mechanism costs approximately $125, however, antirepeat can be used on a full revolution clutch mechanical power press by operating through cylinders and filters.

"Antirepeat" - means the part of the clutch(dog)/brake control system designed to limit the press to a single stroke (cycle) if the tripping means (2 hand controls) is held operative (down). Antirepeat required release of all tripping mechanisms (buttons) before another stroke (cycle) can be initiated. Antirepeat is also called single stroke reset or reset circuit.

"Brake" - means the mechanism used on a mechanical power press to stop and/or hold the crankshaft, either directly or through a gear train, when the clutch is disengaged.

"Bolster plate" - means the plate attached to the top of the bed of the press having drilled holes or T-slots for attaching the lower die or die shoe.

"Clutch" - means the coupling mechanism used on a mechanical power press to couple the flywheel to the crankshaft, either directly or through a gear train.

"Full revolution clutch" - means a type of clutch that, when tripped, cannot be disengaged until the crankshaft has completed a full revolution and the press slide a full stroke.

"Part revolution clutch" - means a type of clutch that can be disengaged at any point before the crankshaft has completed a full revolution and the press slide a full stroke.

"Direct drive" - means the type of driving arrangement wherein no clutch is used; coupling and decoupling of the driving torque is accomplished by energization and de-energization of a motor. Even though not employing a

clutch, direct drives match the operational characteristics of "part revolution clutches" because the driving power may be disengaged during the stroke of the press.
*Explanation - Not correct because a direct drive unit will not stop instantly therefore cannot be considered "Characteristics of part revolution clutches".

"Concurrent" - means acting in conjunction, and is used to describe a situation wherein two or more controls exist in an operated condition at the same time.

"Continuous" - means uninterrupted multiple strokes of the slide without intervening stops (or other clutch control action) at the end of individual strokes.

Control System" - means sensors, manual input and mode selection elements, interlocking and decision-making circuitry, and output elements to the press operating mechanism.

"Counterbalance" - means the mechanism that is used to balance or support the weight of the connecting rods, slide, and slide attachments.

"Device" - means a press control or attachment that:

(i) restrains the operator from inadvertently reaching into the point of operation, or;

(ii) prevents normal press operation if the operator's hands are inadvertently within the point of operation, or

(iii) automatically withdraws the operator's hands if the operator's hands are inadvertently within the point of operation as the dies close.

"Presence sensing device" - means a device designed, constructed and arranged to create a sensing field or area and to deactivate the clutch control of the press when an operator's hand or any other parts of his body is within such field or area.

"Gate or movable barrier device" - means a movable barrier arranged to enclose the point of operation before the press stroke can be started.

"Hold out or restraint device" - means a mechanism, including attachments for operator's hands, that when anchored and adjusted prevent the operator's hands from entering the point of operation.

"Pull-out device" - means a mechanism attached to the operator's hands and connected to the upper die or slide of the press, that is designed, when properly adjusted, to withdraw the operator's hands as the dies close, if the operator's hands are inadvertently within the point of operation.

"Two hand control device" - means a two hand trip that further requires concurrent pressure from both hands of the operator during a substantial part of the die-closing portion of the stroke of the press.

"Die" - means the tooling used in a press for cutting or forming material. An upper and lower die make a complete set.

"Die Builder" - means any person who builds dies for power presses.

"Die Set" - means a tool holder held in alignment by guide posts and bushings and consisting of a lower shoe, an upper shoe or punch holder, and guide posts and bushings.

"Die Setter" - means an individual who places or removes dies in or from mechanical power presses, and who, as a part of his duties, makes the necessary adjustments to cause the tooling to function properly and safely.

"Die setting" - means the process of placing or removing dies in and from a mechanical power press, and the process of adjusting the dies, other tooling and safeguarding means to cause them to function properly and safely.

"Die Shoe" - means a plate or block upon which a die holder is mounted. A die shoe functions primarily as a base for the complete die assembly, and when used, is bolted or clamped to the bolster plate or face of the slide.

"Ejector" - means a mechanism for removing work or material from between the dies.

"Face of the slide" - means the bottom surface of the slide to which the punch or upper die is generally attached.

"Feeding" - means the process of placing or removing material within or from the point of operation.

"Automatic feeding" - means feeding wherein the material or part being processed is placed within or removed from the point of operation by a method or means not requiring action by an operator on each stroke of the press.

"Semi-automatic feeding" - means feeding wherein the material or part being processed is placed within or removed from the point of operation by an auxiliary means controlled by operator on each stroke of the press.

"Manual feeding" - means feeding wherein the material or part being processed is handled by the operator on each stroke of the press.

"Foot control" - means the foot operated control mechanism designed to be used with a clutch or clutch/brake control system.

"Foot pedal" - means the foot operated level designed to operate the mechanical linkage that trips a full revolution clutch.

"Guard" - means a barrier that prevents entry of the opertors hands or fingers into the point of operation.

"Die enclosure guard" - means an enclosure attached to the die shoe or stripper, or both, in a fixed position.

"Fixed barrier guard" - means a die space barrier attached to the press frame.

"Interlocked press barrier guard" - means a barrier attached to the press frame and interlocked so that the press stroke cannot be started normally unless the guard itself, or its hinged or movable sections, enclose the point of operation.

"Adjustable barrier guard" - means a barrier requiring adjustment for each job or die setup.

"Guide post" - means the pin attached to the upper or lower die shoe, operating within the bushing on the opposing die shoe, to maintain the alignment of the upper and lower dies.

"Hand feeding tool" - means any hand held tool designed for placing or removing material or parts to be processed within or from the point of operation.

"Inch" - means an intermittent motion imparted to the slide (on machine using part revolution clutches) by momentary operation of the "Inch" operating means. Operation of the "Inch" operating means engages the driving clutch so that a small portion of one stroke or indefinite stroking can occur, depending upon the length of time the "Inch" operating means is held operated. "Inch" is a function used by the die setter for setup of dies and tooling, but is not intended for use during production operations by the

operator.

"Jog" - means an intermittent motion imparted to the slide by momentary operation of the drive motor, after the clutch is engaged with the flywheel at rest.

"Knockout" - means a mechanism for releasing material from either die.

"Liftout" - means the mechanism also known as knockout.

"Pinch point" - means any point other than the point of operation at which it is possible for a part of the body to be caught between the moving parts of a press or auxiliary equipment, or between the material and moving part or parts of the press or auxiliary equipment.

"Point of operation" - means the area of the press where material is actually positioned and work is being performed during any process such as shearing, punching, forming, or assembling.

"Press" - means a mechanically powered machine that shears, punches, forms or assembles metal or other material by means of cutting, shaping or combination dies attached to slides. A press consists of a stationary bed or anvil, and a slide (or slides) having a controlled reciprocating motion toward and away from the bed surface, the slide being guided in a definite path by the frame of the press.

"Repeat" - means an unintended or unexpected successive stroke of the press resulting from a malfunction.

"Safety block" - means a prop that, when inserted between the upper and lower dies or between the bolster plate and the face of the slide, prevents the slide from falling of its own deadweight.

*(Hazard if in place, flywheel running.)

"Single stroke" - means one complete stroke of the slide, usually initiated from a full open (or up) position, followed by closing (or down), and then a return to the full open position.

"Single stroke mechanism" - means an arrangement used on a full revolution clutch to limit the travel of the slide to one complete stroke at each engagement of the clutch.

"Slide" - means the main reciprocating press member. A slide is also called a ram, plunger, or platen.

"Stop control" - means an operator control designed to

immediately deactivate the clutch control and activate the brake to stop the slide motion.

"Stripper" - means a mechanism or die part for removing the parts or material from the punch.

*(Strips out finished part)

"Stroking selector" - means the part of the clutch/brake control that determines the type of stroking when the operating means is activated. The stroking selector generally includes positions for "off" (clutch control), "Inch", "Single Stroke", and "Continuous" (when continuous is furnished).

"Trip (or tripping)" - means activation of the clutch to "run" the press.

"Turnover bar" - means a bar used in die setting to manually turn the crankshaft of the press.

"Two-hand trip" - means a clutch actuating means requiring the concurrent use of both hands of the operator to trip the press.

"Unitized tooling" - means a type of die in which the upper and lower members are incorporated into a self-contained unit so arranged as to hold the die members in alignment.

"Control system" - means sensors, manual input and mode selection elements, interlocking and decision making circuitry, and output elements to the press operating mechanism.

"Brake monitor" - means a sensor designed, constructed and arranged to monitor the effectiveness of the press braking system.

*90 degrees of crankshaft angle hardest time to stop press. Top dead center of crankshaft angle is the easiest time to stop the press. Brake monitor must be set at 90 degrees of crankshaft angle.

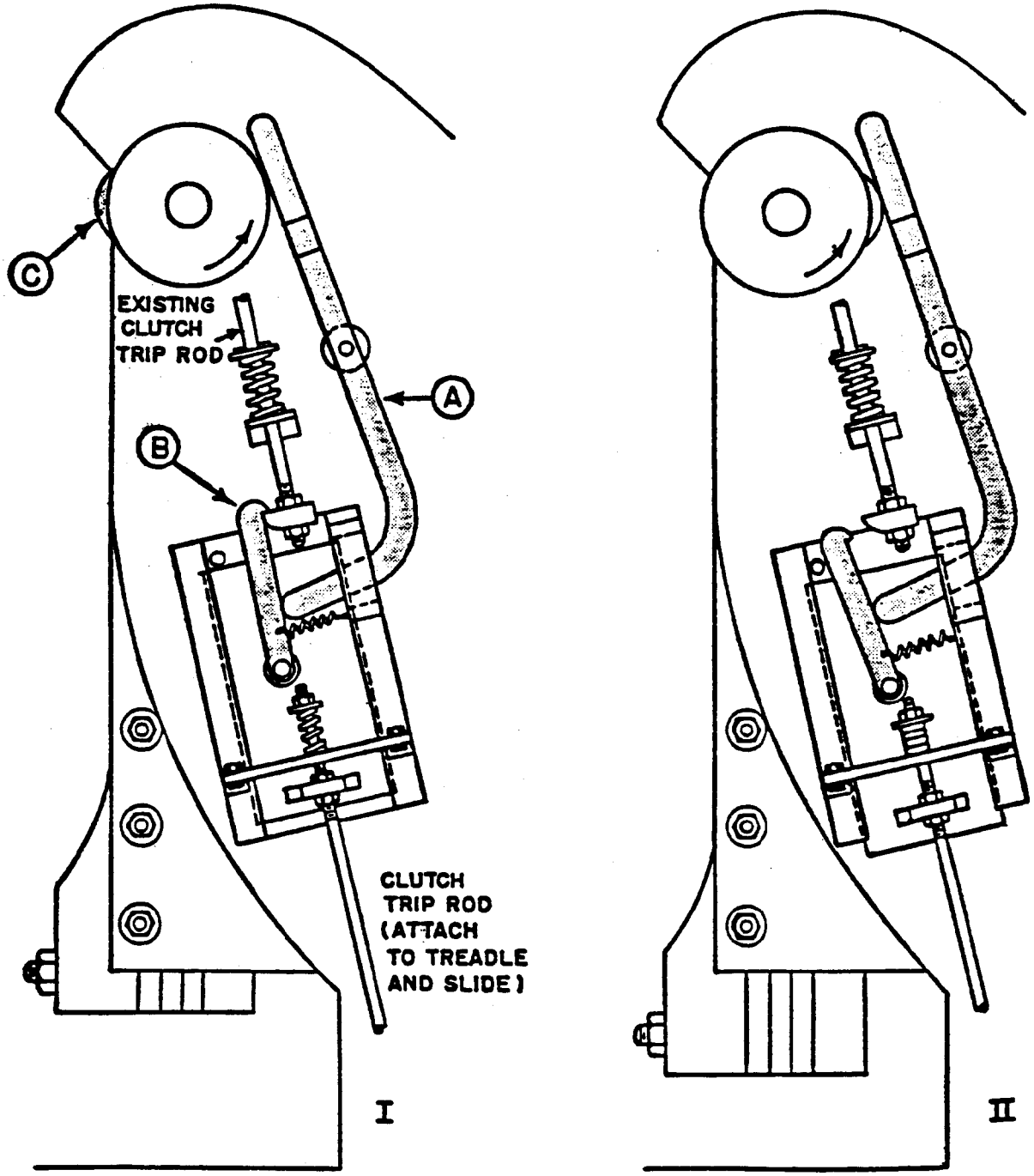
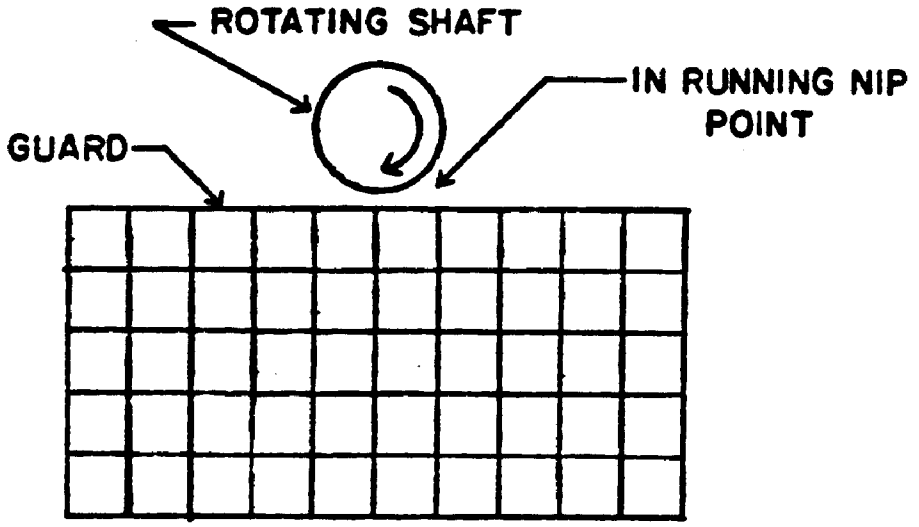
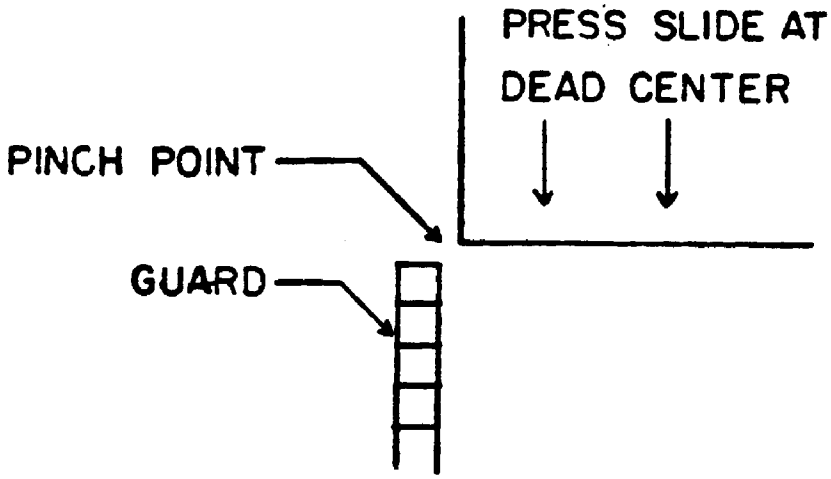


Fig. 23-20. Positive single-stroke attachment for presses with foot-treadle operated clutches. I: Cam (C) permits latch (B) to engage for tripping action, by means of arm (A). II: Cam action disengages latch by preventing operation of press by riding treadle.

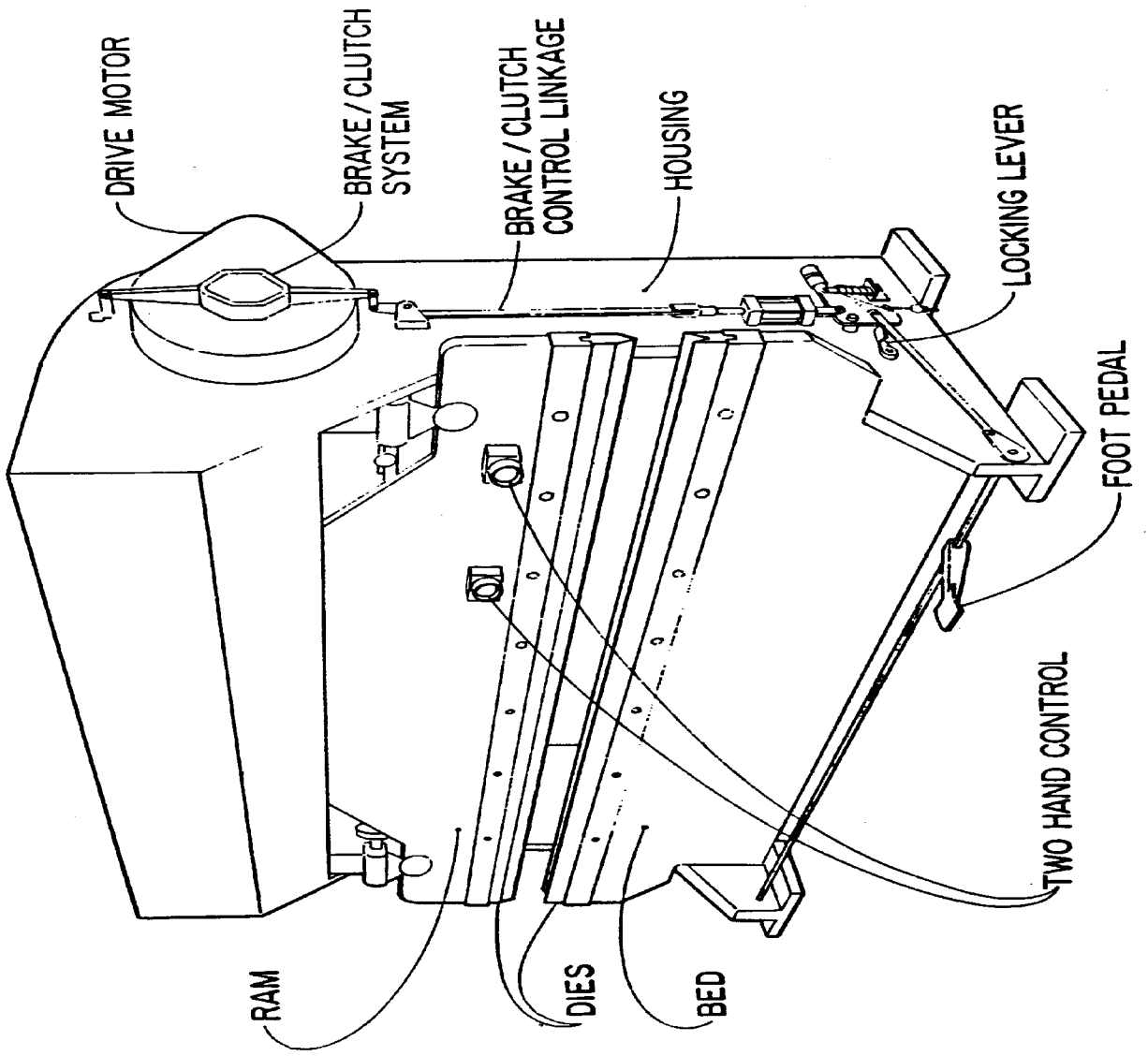


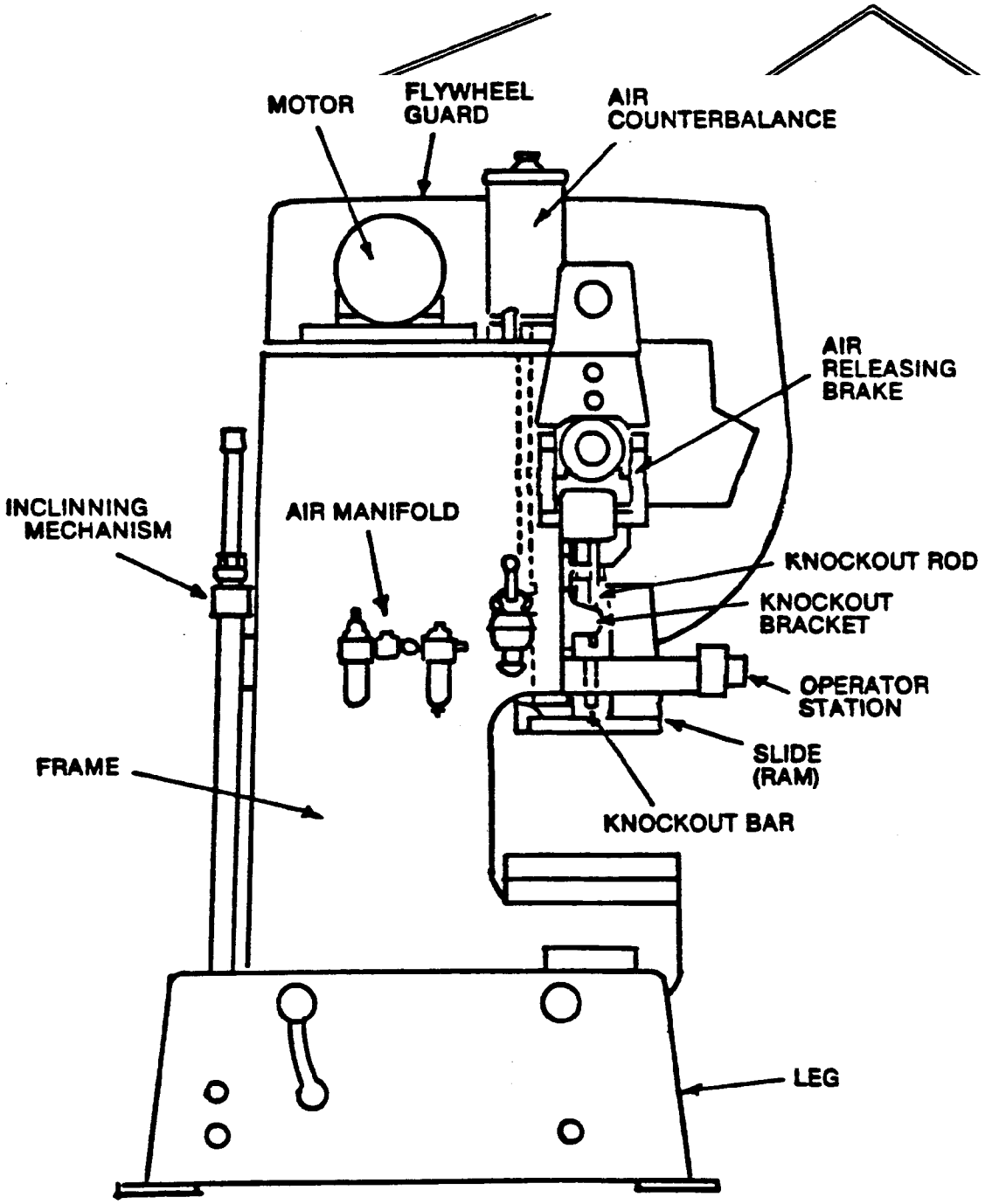
A. INRUNNING NIP POINT BETWEEN ROTATING SHAFT AND GUARD



B. PINCH POINT BETWEEN PRESS SLIDE AND GUARD

FIGURE 5 SECONDARY HAZARDS CREATED BY IMPROPERLY APPLIED GUARDS


DRIVE MOTOR
BRAKE / CLUTCH SYSTEM
BRAKE / CLUTCH CONTROL LINKAGE
HOUSING
LOCKING LEVER
FOOT PEDAL
TWO HAND CONTROL
RAM
DIES
BED



A TYPICAL OBI PRESS

WARNING TO USERS OF RADIO-FREQUENCY SAFETY DEVICES FOR POWER PRESSES

by Anthony Robbins, M.D., Director, NIOSH

The National Institute for Occupational Safety and Health (NIOSH) has learned that radio frequency sensing devices used to protect power press operators from amputations have a possibly serious design limitation that may result in injury to users. The problem affects only those sensing devices using radio-frequency fields. Devices using visible or infrared light are not affected.

When operating properly, the radio-frequency sensing device stops a power press or other machine when a human hand penetrates a zone sensitized by radio waves. However, studies sponsored by NIOSH have shown that the effectiveness of the device is dependent on how the machine operator is electrically grounded. The operator can alter his grounding conditions in many ways, such as by changing shoes, introducing a floormat, changing body position from standing to sitting with feet elevated. Any of these changes could reduce the effectiveness of the sensing device unless the device's controls are readjusted. If the grounding conditions change and the device is not readjusted, the protection zone may contain "holes" through which a worker can reach much further than is safe before a signal is sent to stop the machine. The OSHA and ANSI standards do not contain any criteria on this facet of device performance.

Device manufacturers have been alerted to the problem, and users are asked to contact them for any technical assistance needed. About 6,000 devices are in use in the workplace.

NIOSH emphasizes that the following procedures be followed:

1. Care must be taken to set the device's sensitivity for the operator's grounded condition and allow for variations in an operator's working position during the workday.

2. Supervisors and workers should avoid drastic grounding changes once sensitivity is set and the device is in use. This includes changes in what the operator is standing or seated on.

3. Manufacturer's instructions should be followed carefully in the construction and placement of radio-frequency antennae.

4. The manufacturer of the device should be consulted about specific problems, such as extreme sensitivity variations in particular machine applications.

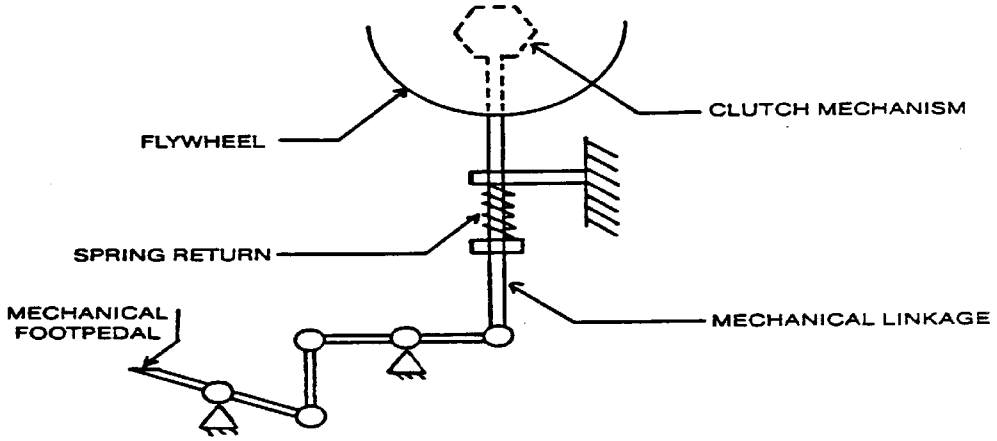
Please report injuries or near injuries possibly attributable to grounding conditions in these devices to:

John Etherton
NIOSH - Division of Safety Research
944 Chestnut Ridge Rd.
Morgantown, WV 26505
Phone: 304-291-4595

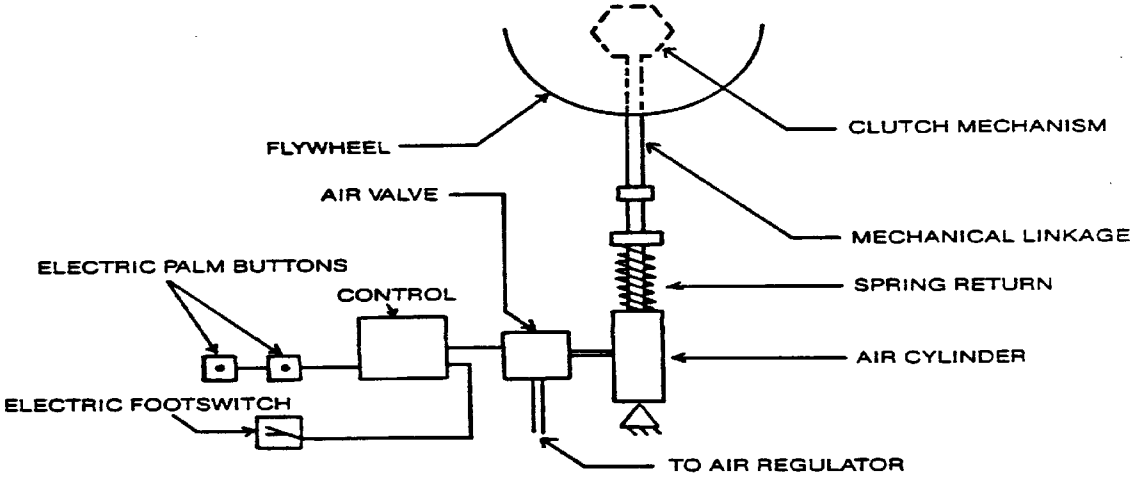
September 6, 1979

Illustration of Electrical Single Stroke Mechanism

A. MECHANICAL FOOT TREADLE OPERATION



B. ELECTRIC SINGLE STROKE OPERATION



MECHANICAL CLUTCH TRIPPING SYSTEMS

TABLE 0-10

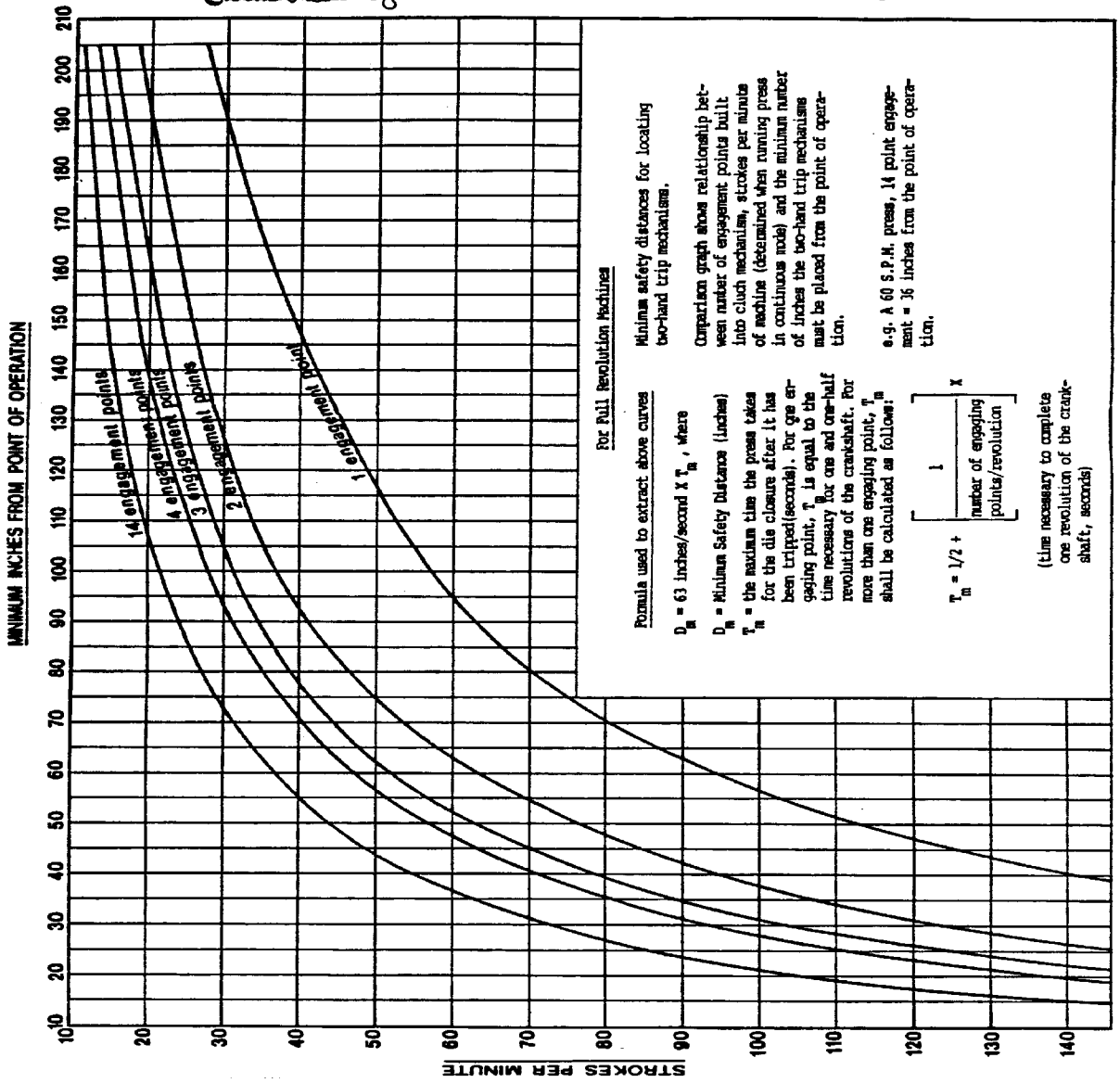
Distance of opening from point of operation hazard (inches)	*Maximum width of opening (inches)*
1/2 to 1 1/2	*1/4*
1 1/2 to 2 1/2	*3/8*
2 1/2 to 3 1/2	*1/2*
3 1/2 to 5 1/2	*5/8*
5 1/2 to 6 1/2	*3/4*
6 1/2 to 7 1/2	*7/8*
7 1/2 to 12 1/2	*1 1/4*
12 1/2 to 15 1/2	*1 1/2*
15 1/2 to 17 1/2	*1 7/8*
17 1/2 to 31 1/2	*2 1/8*

PARTIAL LIST OF ENGAGEMENT POINTS - FULL REV PRESS

# OF ENGAGEMENT POINTS	PRESS MFG
14	NIAGARA ONLY
4	* BLISS, * MINSTER * PRESS RITE
3	ALVA ALLEN JOHNSON VERSON * BLISS CLEARING CLEVELAND CONSOLATED DANLY DIAMONT FEDERAL FERRACUTE L & J TOLEDO * MINSTER * PERKINS ROBINSON ROBINSON ROCKFORD ROUSELLE V & O WALSH WILLIAM/WHITE
2	ALVA ALLEN KENCO * BENCHMASTER * PERKINS * GILRO * PRESSRITE
1	* BENCHMASTER FAMCO * GILRO

*NOTES SOME OVERLAP

Illustration of Minimum Inches from Point of Operation



EXAMPLE 1

A 45 ton full revolution clutch press has two (2) engaging points and the flywheel turns at 60 rpm.

$$rps = \frac{60 \text{ rpm}}{60 \text{ sec./min.}} = 1 \text{ rev./sec.}$$

The number of seconds per revolution is:

$$spr = \frac{1}{rps} = 1 \text{ sec./rev.}$$

The maximum T_s, for the slide to reach bottom after it is tripped is:

$$T_m = (1/2 + 1/n) \times spr = (1/2 + 1/2) \times 1 = 1 \text{ Sec.}$$

The safety distance D_m is:

$$D_m = 63\ T_m = 63 \text{ inches}$$

If this same machine had four (4) engaging points, D_m would still be over 47 inches with the flywheel turning at 60 rpm.

If it was a "Niagara" press with 14 engaging points at 60 rpm, D_m would be 36 inches.

EXAMPLE 2

A full revolution clutch press has a flywheel speed of 120 rpm and four (4) clutch engaging points.

$$rps = \frac{120\ rpm}{60\ sec./min.} = 2\ rps$$

$$spr - 1/rps = 1/2 = .5\ sec./rev.$$

$$T_m = (1/2 + 1/n) \times spr = (1/2 + 1/4) \times .5 = .375\ sec.$$

$$D_m = 63\ T_m = 23.62\ inches$$

DIE SETTING PROCEDURES

A. Prepatory Action

1. Have the proper die ready for mounting when the press becomes available.

2. Transport the die to the press with adequate die handling equipment.

    *Small die - die table or lift truck
    *Large die - lift truck or overhead crane

3. Check the tool visually for correct working condition; cutting edges; weak, broken springs; slug and blank holes; locators, stops, gauges and guides; knock-out pins, and bushings, die-sets; and die shank.

4. Provide enough material for a try out. Check for correct type, quality and size. Check for dirt and damage.

5. Check press for type, size (capacity), speed, stroke, shut height, die space, and attachments (feeding and ejection, cushion, guards and air).

6. Notify the area foreman of problems or questions on the above items.

B. Setting the Proper Die Position

1. Shut off the power while the die is being set up or adjustments are being made on the tool or press. USE SAFETY BLOCKS ANY TIME DIE ADJUSTMENTS ARE MADE.

2. Clean the press table of all material. Check the working conditions of the press, while in a "standstill" condition, the clutch, brake, counterbalance, knock-out bar, ramplay, etc. If an adjustment is necessary, notify the foreman or area maintenance person.

3. Clean the clamping surfaces of the press table and ram carefully and thoroughly. Remove nicks, burrs and raised spots on contacting surfaces and on tapped holes. Remove grease, dirt, chips, slugs and all foreign metal from the slide.

4. Raise ram adjustment (shut) height, if necessary.

5. Clean die set thoroughly (top and bottom surfaces). Remove nicks and burrs.

6. Slide the die on the press table and locate it correctly with respect to the ram.

7. Check alignment of all clearance holes for blanks and/or slugs.

8. During the handling of the die, rest the punch holder on bumper pins, die stops, die blocks or kiss blocks.

9. In case of cutting dies, cover air cushion pin holes in press bed.

10. In case of cushion pressure pad type dies, place correct length pins into proper pattern as described in layout for die setup.

11. Shut off power.

12. Bring down slide by inching (coasting) until ram button contacts punch holder stop.

13. Adjust shut height.

14. Securely fasten the movable top part of the die to the slide.

15. Securely clamp the movable part of the die to the bolster plate or press table. Use only substantial clamps and bolts in first class condition.

16. Check and adjust shut height, again.

17. Tighten the locking nut of the pitman screw after each slide adjustment.

18. "Bleed off" excess pressure on the counterbalance. Reset the air to the proper pressure to equalize the die weight on the ram. The weight of the upper die shoes must be stamped on the die. 1910.217(b)(9)(iv), 1910, 217(b)(9)(ii) and 1910.217(d)(6)(ii).

19. Connect and adjust air pressure. When the cushion pressure pad is used, the air pressure must be turned on when the die is closed (ram down). Set

the air pressure to the prescribed settings.

20. Lubricate the die (grease leader pins and oil slides) at the beginning of each shift. Use light oil on ball bearing type leader pins.

21. In case of small presses, turn the flywheel by hand a few times.

22. Dry run (with power) a couple of strokes to check die operation.

23. In case of adjustable stroke, select and adjust to specified s.p.m.

24. Position the slip stock for hand feeding or coil stock for automatic or manual feeding.

25. Check ease of feeding and adjust stock guides, if necessary.

26. Lubricate stock if required.

27. Make a few trial parts. Check them for irregularities such as burrs or missing holes; study shear marks and the breaks around the blank and hole peripheries. Make necessary adjustments until parts appear acceptable.

28. Submit several sample parts for final inspection check.

29. After receiving an "OK" from inspection, check that the power is shut off.

30. Re-tighten every nut, bolt and screw.

31. Re-check alignment of the die member.

32. Activate (install) the automatic and semi-automatic feeding and unloading devices (conveyors, chutes, etc.) and automatic stock lubrication. Air blow off pressure is to be set at 30 p.s.i. <u>maximum</u> and one blow off per die. 1910.241(b)

33. Replace all safety devices (leader pin guards, limit switches). <u>All press guards are to be in place for optimum safety</u>. Check all safety circuits for operation.

34. Run enough parts, simulating production conditions.

C. Housekeeping

1. Remove all debris that does not belong to the job: e.g. setting tools, oil cans, nuts, bolts, screws, gloves, waste rags, scrap, stock, etc.

2. Arrange the work place: stool, tote, pans, etc.

3. Notify the foreman that the press is ready to run.

D. Before Releasing a Setup For Production

1. Check die set.

2. Check press brake.

3. Check anti-repeat device.

4. Set counting device to 0.

5. Provide reasonable quantity of stock.

6. Provide reasonable quantity of lubricant.

7. Instruct operator about correct operation of the die: start and stop, safety, inspection, etc.

E. After Completion of Run

1. Inspect the tool and notify area foreman.

2. Supply last piece parts to Q.C. inspection.

3. Inch the ram to stroke bottom.

4. Remove safety guards and air connections.

5. Remove clamps from stationary part of die.

6. Loosen ram lock nuts or remove plate.

7. Remove chutes.

8. Inch the ram to top of the stroke.

9. Shut off power.

10. Slide die out of lift truck.

11. Check and inspect the die visually.

12. Clean die of slugs, etc.

13. The last part and strip skeleton go to storage with the die.

14. Lower die to skid.

15. Transport die to designated area of storage room or die shop for repair.

F. General Practices Involving Die and Press Operations

1. Dies to have minimum of 1/4 inch spacers (wood) on die stop, die block or kiss blocks, when stored or transported. (The springs should not be under compression.)

2. Re-set counterbalance pressures for each die.

3. "Center up" dies in each press to balance loading or connections of press.

4. In extreme operating methods, the "off center" location of a die and the tonnage requirements must not exceed 30 percent of the total press capacity under one connection.

   EXAMPLE: 200 ton press - 30% = 60 tons

   Tonnage required to make part equalling 60 tons or less will allow a set-up under one connection in a 200 ton press.

5. Cushions (pressure pads) must be balanced. In all cases follow pin layout as supplied with each die.

SUGGESTED
MONTHLY PRESS INSPECTION CHECKLIST

Name of Press_____

Press Serial No._____

Press Model No._____

Date Inspected_____

Maintenance, Mechanics Initials_____

Special Notes_____

Operative_____

Needs Maintenance_____

Shutdown_____

WARNING

Before inspecting or repairing the press or auxiliary equipment, always place the slide at the bottom of the stroke and turn the power off. Also, turn the air supply off and bleed off counterbalance air if furnished. Let the flywheel come to a complete stop. If air and power are required for some of the inspections, use extreme caution. Once the power is "OFF", lock the disconnect in the "OFF" position. Place safety blocks in position.

SUGGESTED
MONTHLY PRESS INSPECTION CHECKLIST
-CONTINUED-

Pneumatic Equipment

1. Counterbalance Cylinders (if furnished)

_____ a. Ensure that adequate and correct air pressure is being supplied.

_____ b. Check that all counterbalance mounting rods are securely tightened.

_____ c. Check that counterbalance does not leak.

2. Air Pressure Switches

_____ a. Check physical condition of pressure switch.

_____ b. Check for proper functioning by reducing the air pressure below the preset operating range of the pressure switch. This must prevent normal operation of the press.

3. Air Gages

_____ a. Check for proper operation.

4. Air Pressure Regulator

_____ a. Check for proper functioning by turning the adjustment screw clockwise or counterclockwise. The gauge reading should respond accordingly.

_____ b. Ensure that air supply is adequate, clean and constant.

5. Air Piping and Connections

_____ a. Check the condition of all piping, tubing, hoses and fittings. Also, check their support hardware for loose, broken or missing parts.

_____ b. With the air pressure on, check all air lines and connections for leaks, mashed or broken sections.

6. Flywheel Brake (if furnished)

_____ a. Inspect lining for wear. Replace if worn.

_____ b. Inspect flywheel brake mounting screws for tightness.

_____ c. Actuate flywheel brake and check the operational response.

7. Pressure Relief Valve in Air Tank (if furnished)

_____ a. Check condition of valve.

_____ b. Operate valve manually to determine if working properly.

Electrical Equipment

1. Rotary Limit Switch

_____ a. Check sprocket chain drive to limit switch for loose, worn or damaged parts.

_____ b. Check rotary cam limit switch mounting bracket for tightness of mounting bolts.

_____ c. Check condition of components and wiring. Also, check terminal connections for tightness.

_____ d. Check the holding time requirements for the "single" stroke mode. The operator must be required to keep both hands on the "Run" button during the closing portion of the stroke.

2. Control Panel

_____ a. Check that all electrical components, wire terminals and connections are tightened properly.

_____ b. Check all electrical components for pitted contacts and deposits of foreign matter, etc. Also, note any signs of overheating components.

_____ c. Check motor heaters and fuses for proper size.

_____ d. Check wiring for damaged insulation.

_____ e. Check that press frame and control panel are

properly grounded.

_____ f. Check transformer for excessive heat.

_____ g. Check brake monitor functioning.

3. Motor

_____ a. Check motor mounting bolts and motor bracket mounting bolts for tightness.

_____ b. Clean, lubricate and service motor as recommended in the motor manufacturer's instructions.

_____ c. Check motor for overheating.

General Press Equipment

1. Clutch Assembly (Part Revolution [Air])

_____ a. Check clutch for loose, damaged or broken parts.

_____ b. Check clutch for air leakage.

_____ c. Check for proper operation in engaging and disengaging. Operation must be smooth and positive.

_____ d. Check clutch for excessive wear.

2. Slide Adjustment Parts

_____ a. Check adjusting screw threads and worn gears for damage or foreign matter that might impair proper operation. Presses Equipped With Power Slide Adjustment

_____ b. Check that all springs and sprockets are tight, lubricated and properly aligned.

_____ c. Clean, lubricate and service slide adjustment motor in accordance with manufacturer's instructions.

3. Flywheel, Belts and Motor Sheave

_____ a. Check V-belts for proper tension.

_____ b. Check V-belts for cracks and wear.

_____ c. Check motor sheave grooves for wear, cracks or rough areas.

_____ d. Check motor sheave mounting for proper tightness.

_____ e. Check for proper alignment between sheave and flywheel.

4. Bolster Plate

_____ a. Check that bolster plate is securely mounted to bed.

_____ b. Check that no foreign material is lodged between bolster plate and bed.

_____ c. Check that bolster plate is free of nicks and scratches.

5. Fasteners

_____ a. Check all screws, nuts and bolts for tightness.

_____ b. Replace any missing or broken screws, nuts and washers.

6. Shafts

_____ a. Check shaft for run out and end play.

7. Keys

_____ a. Check all keys for tightness.

8. Connecting Rods

_____ a. Check brushings for excessive clearance.

_____ b. Check that dowel pins are in position.

9. Name Plates and Decals

_____ a. Check that none of the "warning" and instruction signs have been removed, defaced, hidden or covered.

10. Dies

_____ a. Inspect the dies for safe operating conditions.

_____ b. Examine dies for sharp edges and pinch points which may have developed as a result of a new installation or usage.

_____ c. Check the dies for proper guarding.

11. Brakes

_____ a. Check brake for proper mounting.

_____ b. Check for air leaks with part revolution clutches.

_____ c. Check for lining wear.

_____ d. Check for proper adjustment.

_____ e. Check that brake lining is free from grease and oil.

12. Gears and Pistons

_____ a. Check gear and piston for evidence of wear.

_____ b. Check that piston and gear keys are tight and properly aligned.

13. Bearings

_____ a. Check sleeve bearing for excessive wear and/or looseness.

_____ b. Check anti-friction bearings for noise and heat.

14. Levels

_____ a. Check that press weight is being supported proportionally at all points.

_____ b. Check level of press with precision level on bolster (or bed). Press should be level within .001" per feet of bolster width right-to-left and front-to-back.

15. General Inspection

_____ a. Check major components not previously inspected for wear, cracks or broken sections.

_____ b. Check press for missing parts or missing accessory items.

_____ c. Check press foundations that are loose, broken or sinking.

_____ d. Check appearance of press. Repaint or clean if

required.

Inspected by _____ Date _____

Press Approved for Production by _____

Date _____

Description of Unsatisfactory Conditions _____

_____

Corrective Steps Taken _____
_____

Date _____

COMMENTS:

SUGGESTED
WEEKLY PRESS INSPECTION CHECKLIST

Name of Press_____

Press Serial No._____

Press Model No._____

Date Inspected_____

Maintenance, Mechanics Initials_____

Special Notes_____

Operative_____

Needs Maintenance_____

Shutdown_____

WARNING

Before inspecting or repairing the press or auxiliary equipment, always place the slide at the bottom of the stroke and turn the power off. Also, turn the air supply off and bleed off counterbalance air if furnished. Let the flywheel come to a complete stop. If air and power are required for some of the inspections, use extreme caution. Once the power is "OFF", lock the disconnect in the "OFF" position. Place safety blocks in position.

SUGGESTED
WEEKLY PRESS INSPECTION
-CONTINUED-

Pneumatic Equipment

_____ 1. Air Filter - Shut off air supply and release system air pressure. Open filter drain cock to release trapped moisture and foreign matter. Draining not required if press is equipped with automatic draining filter.

_____ 2. Air Gages - Check accuracy, condition and proper pressure setting.

_____ 3. Air Tanks - Drain accumulated moisture.

_____ 4. Counterbalance Cylinders (if furnished) - Drain accumulated moisture from cylinders through drain in counterbalance tank.

_____ 5. Valves and Solenoids - Check for proper operation in coordinating clutch and brake action. Manually depress the plungers of the dual actuating valves one at a time to "fail" the valves. Reset by depressing pneumatic recock valve mounted on front of solenoid valve. Check for air leakage from valves. Replace entire valve if it is not working properly.

Lubricating Equipment

1. Air Lubricator

_____ a. Drain any accumulated water from bowl.

_____ b. Fill bowl with proper lubricant.

_____ c. Check condition and operation of lubricator.

2. Lubrication System

_____ a. Check oil level reservoir daily.

_____ b. Check system for loose or broken tubing, worn hoses, loose fittings and connections.

_____ c. Check that proper lubrication is used.

_____ d. Check that all points are receiving the proper amount of lubricant.

3. Manual Lubrication

_____ a. Check that all gears and pinions are properly lubricated.

_____ b. Check that all points which require manual greasing or oiling are being lubricated as required.

_____ c. Lubricate compression springs on presses with full revolution (mechanical) clutches to prevent rusting.

Electrical Equipment

NOTE: Replace components whenever doubtful about their operating condition. Ensure that all components are clean.

1. Push Buttons

_____ a. Check all "Run" buttons for proper guarding.

_____ b. Visually inspect all loose, cracked or broken sections.

_____ c. Check operational response of all two-hand "Run" buttons.

_____ d. Check "Stop" and "Top Stop" buttons for proper functioning.

2. Selector Switches

_____ a. Inspect all selector switches for operational response in each designated mode.

_____ b. Check each selector switch for damage and wear.

c. Report any unauthorized use of selector keys to supervision.

3. Foot Control

_____ a. Check that foot switch cover is in place and working properly.

_____ b. Check foot control for proper operation.

_____ c. Inspect foot control cord, plug, socket, and terminal for loose, worn, cracked or damaged parts.

_____ d. Ensure that when a foot control is used the press is furnished with a proper point of operation guard or other suitable safety device.

General Press Equipment

1. Press Covers and Press Guarding

_____ a. Check that all covers are in place and tightly secured.

_____ b. Check and report any bypassing of guards or safety devices.

_____ c. Check and report any condition that would require additional operational guards.

_____ d. Inspect the condition of personal protective equipment and material handling tools.

_____ e. Check for proper functioning of all point of operation guarding.

2. Cleanliness

_____ a. Check that the die area is clean and free of any material, rags, scraps, etc., which may have accumulated. Use proper cleaning procedures to eliminate the need for placing hands into the die area.

3. Clutch Linkage

(Presses with Full Revolution Mechanical Clutches)

_____ a. Inspect for worn, damaged, broken or loose components.

_____ b. Inspect for bent studs and screws.

_____ c. Check that single stroke mechanism is in place.

_____ d. Check that compression springs are working properly.

_____ e. Check that foot control cover is mounted in place and working properly.

4. Clutch Assembly (Part Revolution [Air])

_____ a. Check clutch for loose, damaged or broken parts.

_____ b. Check clutch for air leakage.

_____ c. Check for proper operation in engaging and disengaging. Operation must be smooth and positive.

_____ d. Check for excessive wear.

5. Brakes

_____ a. Check brake for proper mounting.

_____ b. Check for air leakage on presses with part revolution clutches.

_____ c. Check for lining wear.

_____ d. Check for proper adjustment.

_____ e. Check that brake lining is free of grease and oil.

SAMPLE FORM

PULL-OUT - RESTRAINT - INSPECTION

Each pull-out device or restraint in use shall be visually inspected and checked for proper adjustment at the start of each operator shift, following a new die set-up, and when operators are changed. Necessary maintenance, repair or both shall be performed and completed before the press is operated.

MACHINE NO._____ DEPARTMENT_____ OPERATOR I.D._____ DATE_____
TIME_____ SHIFT CHANGE_____ DIE CHANGE_____ OPERATOR CHANGE_____

A SEPARATE DEVICE SHALL BE PROVIDED FOR EACH OPERATOR IF MORE THAN ONE OPERATOR IS USED ON A PRESS. PART INSPECTED APPLIED TO EACH DEVICE.

OK	NOT OK	PART INSPECTED	IF NOT OK, CONDITIONS	DATE OF CORRECTION
___	___	All parts, Nuts, Bolts, etc. Secure	_____	_____
___	___	Attachments Connected to and Being Operated Only by the Press Slide or Upper Die	_____	_____
___	___	Attachments Adjusted to Prevent Each Operator from Reaching into the Point of Operation or to Withdraw the Operator's Hands from the Point of Operation Before the Die Closes	_____	_____
___	___	Horizontal Support Secure	_____	_____
___	___	Vertical Support Secure	_____	_____
___	___	Cables Must Not be Bent, Frayed or Twisted	_____	_____
___	___	Brackets Secure and in Good Condition	_____	_____
___	___	Visual Inspection of Total System	_____	_____

POWER PRESS POINT-OF-OPERATION INJURY REPORT

Mailing address at which accident occurred:

Company Name_____

Address_____

City_____ State_____ Zip_____

Name of injured employee:_____

Injury sustained:_____

Task being performed: _____ Operation _____ Maintenance
_____ Set-Up _____ Other

Type of feeding:
_____ Manual with hand in point-of-operation
_____ Manual with hand not in point-of-operation
_____ Semi Automatic
_____ Other
_____ Not applicable

Description of press involved:

Type of clutch:
_____ Full revolution
_____ Part revolution
_____ Direct drive

Type of safeguard:
_____ Die enclosure guard
_____ Fixed barrier guard
_____ Interlock press barrier guard
_____ Adjustable barrier guard

Devices:
_____ Movable barrier
_____ Presence sensing
_____ Pull-out
_____ Hold out
_____ Two-hand control
_____ Two-hand trip
_____ Other _____

Means used to actuate press:
_____ Foot trip
_____ Hand control
_____ Foot treadle
_____ Other _____

Number of operators required for this operation:_____

Number of operators provided with control and safeguard:_____

Alleged cause of accident:
(Repeat of press, Removing stuck part, Safeguard not provided, Safeguard failure, Operation error, Safeguard not used)

Describe:_____

_____

_____

_____

Corrective action to prevent similar accident:_____
_____

MINIMUM REQUIREMENTS FOR POWER PRESS OPERATORS TRAINING

The operators of mechanical power presses should be trained in all phases of the operation of the equipment and its capabilities and limitations, and:

A. All press controls and how to use them.

B. The operator should be informed of the safety guards and devices incorporated on the machine and the correct use of each.

C. Each operator should be instructed in the use of tools for removing stuck work and use of swabs, brushes, or oil cans for lubricating dies and stock.

D. Press operators will need to understand why, when, and how to use personal protective equipment, such as safety glasses, gloves, safety shoes, and hearing protection.

E. The storage of parts, tools, or other objects on dies, die sets, bolster plates, or press components not designed to retain them; present hazards of falling on operators; and possible pinch points with moving components. Operators should be aware of these hazards, as well as the basic housekeeping around the press areas.

F. Press operators should be instructed not to operate the press until the press has been checked and tested several times prior to production operations. He should report any problems which he observes to the proper person.

G. Employees who are going to operate presses should receive a minimum of 8 hours* on the job training under supervision prior to being assigned to operate the presses.

*this could be up to 2 weeks or more, depending on the complexities of the operation.

MINIMUM TRAINING REQUIREMENTS FOR PRESSROOM SUPERVISORS

A. The foreman should be informed of his responsibilities to the employer and the employees who work with him.

B. He should know the hazards of power press operations and their set-up and maintenance.

C. The pressroom foreman should be knowledgeable of what the safety guards and devices are intended to do and the correct adjustment and use of each.

D. He should check each set-up and be sure that all operators are instructed in safe power press operations before they start work.

E. It is his responsibility to insure that correct operating procedures are being followed.

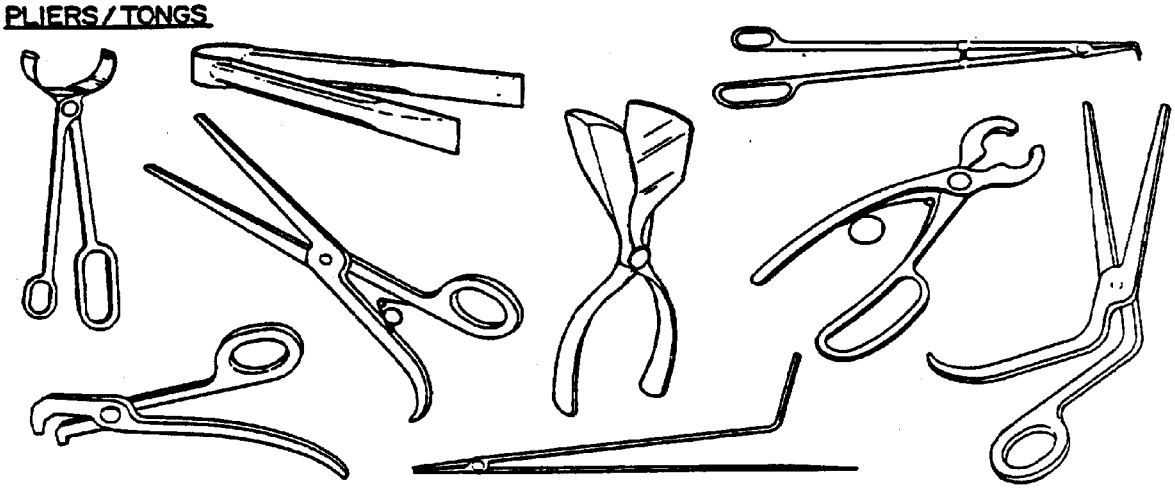
F. The foreman should see that all maintenance is performed and that presses are in safe repair prior to their operation.

As the employer's representative, the pressroom supervisor is responsible for the training and operations of the employees under his control.

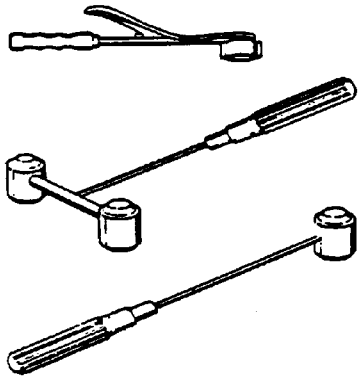
HAND FEEDING TOOLS

USED FOR
- PLACING WORKPIECE IN POSITION BETWEEN DIES
- REMOVAL OF PROCESSED WORKPIECE FROM POINT OF OPERATION

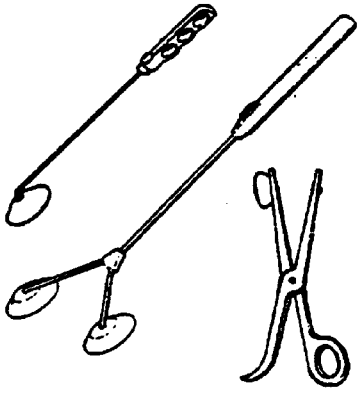
PLIERS / TONGS



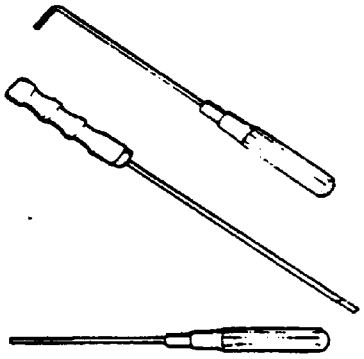
MAGNETIC LIFTERS



SUCTION CUP LIFTERS



POSITIONERS



Graphics by Mary A Misiewicz

U.S. Department of Labor
Occupational Safety and Health Administration

Mechanical Power Presses

Questions and Answers

U.S. GOVERNMENT PRINTING OFFICE 1984—804-579

MECHANICAL POWER PRESSES
QUESTIONS AND ANSWERS

I. Scope of the Standard

II. Control Systems & Brake Monitor

III. Presence Sensing

IV. Pull-outs and Sweeps

V. Two Hand Trips & Controls

VI. Type A & B Gates

VII. Barrier Guards and other safeguarding

VIII. Safety Distance

IX. Recordkeeping

NOTE: Under no circumstances shall the following be used in lieu of the specific language of the law, and final determination of the requirements shall be checked with OSHA.

Several questions and answers are referenced according to specific sections of the law.

(I) SCOPE OF THE STANDARD

1. Q. Does the standard for mechanical power presses cover these presses when other materials are being worked such as nonferrous metals, plastic materials, or other materials?

   A. The Section 1910.217 requirements do not contain a statement of scope and application at present. The intent of OSHA is to honor the scope as stated in ANSI B11.1-1971 which was adopted under Section 6(a) of the Act. B11.1-1971 scope statement covers presses used to cut, form, ... "Other materials" when the die is attached to the slide. B11.1 also covers the use of unitized tooling. The use of mechanical power press to work on aluminum, tile, or non-ferrous metals hardly changes the need for operator safeguarding based on the material being processed.

2. Q. Are press brakes covered by the standard for mechanical power presses?

   A. No.

3. Q. What types of presses or other metal working machines are exempt from Section 1910.217?

   A. Some types of presses not covered by 1910.217 are envelope making (window cutters, etc.) machines, dinkers and clickers used for cutting leather and other materials, brick presses, broaching machines, abrasive wheel presses, platen presses, powdered metal presses, hot bending and forming machines, forging presses.

4. Q. If a press brake is fitted with dies and functions as a mechanical power press, is safeguarding required?

   A. Yes.

5. Q. Are hot bending operations covered by Section 1910.217?
   1910.217(a)(5)

   A. No.

(II) CONTROL SYSTEM & BRAKE MONITOR

6. Q. For ungrounded circuits, is the first ground considered a failure?

   A. No.

7. Q. When operating a continuous run, is a single failure in the press control system required to stop the press?

   A. No, it prevents a successive continuous run being initiated.

8. Q. If a press is only operated on continuous, must a single stroke mechanism be provided?
   1910.217(b)(3)
   1910.217(b)(7)(xi)

   A. No.

9. Q. If a press stroke cannot be initiated because of the brake monitor action, how is this indicated to the operator?

   A. The control system may have an indicator light or alarm. The visual inspection of markings on the crankshaft will show that press slide has not stopped within the safe range previously established. The press won't run.

10. Q. If the brake monitor is actuated by top stop overrun, can the brake initiation point be set earlier in the cycle if the safety distance is recalculated and two-hand controls moved?

    A. Yes, this practice is allowed as long as the brake is deemed to be functioning within its stopping time limit before overhaul and repairs are required.

11. Q. If a press stops at some point of the cycle due to the brake monitor, how is the press slide returned to top of stroke?

    A. The inch controls or other bypass circuit are used to return press slide to top of stroke.

12. Q. Must brake monitors detect brake deterioration when the brake is applied at other than top of stroke?

    A. No, but some types of brake monitor will give an indication of stopping time on each brake application at any point in the stroke.

13. Q. Can a press be operated on-the-hop with a brake monitor?

A. No, the press slide must stop on each stroke for the brake monitor to be effective.

14. Q. Is a brake monitor necessary on a full revolution clutch press?

A. A brake monitor is not required on a full revolution clutch press. Brake monitor manufacturers and users are claiming that they are feasible and useful on a full revolution clutch press.

(III) PRESENCE SENSING

15. Q. Do presence sensing devices require some form of supplemental additional guarding to protect press operators?

A. Yes, unless the sensing field covers all paths of access to the point of operation; therefore, some additional safeguarding is required such as fixed barrier guard, Type A or B gate or movable barrier device, or another presence sensing device.

16. Q. What are the limits of muting of a presence sensing device to enable parts ejection, feeding, or circuit checking?

A. Top of stroke is the point at which muting shall cease as it is not possible to set a point on the downstroke at the exact position where the hazard of die closing starts.

(IV) PULL-OUTS & SWEEPS

17. Q. Are pull-outs acceptable for safeguarding the press operator when press stroke is actuated by a foot pedal or a two-hand trip not meeting the required safety distance?

A. Yes, the pull-outs by themselves are recognized as an acceptable safeguard.

18. Q. Why are detailed requirements given for checking and adjusting of pull-outs?
1910.217(c)(3)(iv)(d)

19. Q. Can a restraint be used for "hands in dies" feeding?

A. No. By definition the restraint does not permit entry of the hand into the die or point of operation.

20. Q. Can a restraint used for one hand be used in conjunction with a single trip or control button for the 2nd hand, where the 2nd hand is used for feeding into the point of operation?

A. Yes, if a safety distance is established for the one-hand trip or control button.

21. Q. What is the difference between a restraint and a pull-out device?

A. The restraint prevents entry of hands or fingers to the point of operation at all times, while the pull-out device will allow hands in dies for feeding.

22. Q. Are restraints or hold-outs a recognized form of safeguarding from the hazard of the point of operation?

A. Yes, the restraints which keep operators hands out of the point of operation at all times are an acceptable safeguard.

23. Q. Must an operational sweep device be physically removed from a press after December 31, 1976?
1910.217(c)(3)(v)

A. No, the sweep device may be left operational as a back-up safeguard if desired.

24. Q. Are two-hand trips recognized as an acceptable means of safeguarding the operator from the hazard of the point of operation?

A. Yes, providing the safety distance between the point of operation and the two-hand trips is determined by the appropriate formula.

(V) TWO HAND TRIPS & CONTROLS

25. Q. What are some of the methods or means used to fix the position of two-hand trips or controls at the safety distance?

A. Articulating or extendable bars or control mounts, clearly established floor position for portable control stands, or other administrative controls may be used when it is not possible to mechanically or electrically fix the portable stand or station in position.

26. Q. Can a two-hand trip be used as a safeguard on a part revolution clutch press?

A. Yes, providing the safety distance for locating the trips is adequate.

27. Q. What methods are used to fix the position of two-hand trips or controls?

A. Key-locked control stations, key-locked portable control stands, removable plug-in control stations, portable stand floor location fittings, portable stand bases which establish a safety distance, or movable control bars or buttons fixed by fasteners which require the use of special tools to remove.

28. Q. Can a two-hand control be used as a trip on a part revolution clutch press?

A. Yes, the holding time is adjustable and could be set to perform like a two-hand trip.

29. Q. On a two-hand control, what "holding time" is required?

A. None, but to qualify as a "control" rather than a "trip" it must be possible to set a "holding time."

30. Q. Must "holding time" cover the entire period of die closing or until the hazard of die closing ceases at 1/4 inch opening?

A. No, holding time can be set for any period of time during the cycle. Press stopping time is the critical factor in establishing the safety distance for safeguarding means.

(VI) TYPE A & B GATES

31. Q. Is a Type A gate an acceptable safeguard with a two-hand trip or two-hand control without adequate safety distance determined by the appropriate formula?
1910.217(c)(3)(i)(e)

A. Yes, the Type A gate alone will satisfy the requirements for safeguarding with any form of press actuation such as foot pedal or control, two-hand trip or control without safety distances, or others such as one-hand trip.

32. Q. Can a Type A gate be opened during the downstroke of the slide?
1910.217(c)(3)(ii)(a)

A. No, a Type A remains closed.

33. Q. Can a Type B gate be opened during the downstroke of the slide?
1910.217(c)(3)(i)(g)

A. Yes, on a part revolution clutch press until slide motion ceases.

34. Q. When manual feeding with hands in dies, can a Type B gate or movable barrier device be used for safeguarding on a full revolution clutch press?

A. Yes, the Type B gate or movable barrier device which permits manual feeding on the upstroke is an acceptable safeguard.

35. Q. If a Type B gate is used as a means of safeguarding, can a presence sensing light curtain be used to actuate the Type B gate which subsequently initiates the press to work?

A. Yes, the presence sensing light curtain is then only actuating the Type B gate (the operator safeguard).

36. Q. If a Type B gate can be opened during the closing stroke(on a part revolution clutch press), what safety distance is required to be sure slide motion stops before hands reach the point of operation?
1910.217(c)(3)(i)(g) & (c)(3)(ii)(b)

A. A safety distance must be used to insure that the operator's hands cannot reach the point of operation prior to die closing or reaching a point (1/4 inch die opening) where no hazard of die closing exists.

(VII) BARRIER GUARDS & OTHER SAFEGUARDING

37. Q. Can an interlocked barrier guard be installed on a press for protection of an operator manually feeding strip stock through openings in the side or through the movable section of the interlocked barrier guard?
1910.217(c)(2)(iv), 1910.217(c)(2)(v), 1910.217(c)(2)(vi)

A. Yes, this form of guard may be used, however, the hinged or movable section must be interlocked and can only be opened for clearing a jam or piece of scrap or die changing when the machine has stopped.

38. Q. Can "redundant" or "alternative safeguarding" prescribed by the latest draft B11.1 revised standard be used in lieu of the OSHA 1910.217(c)(5) "Additional Safeguarding" requirements for part revolution clutch presses (using two-hand control, presence moving or Type B gate of movable barrier device)?

A. Yes, providing a variance has been granted by OSHA under Part 1905 regulations. The approval of the revised ANSI B11.1-1975 standard may warrant a future proposed amendment to grant acceptance to the option of "alternative safeguarding" under OSHA standards. All new or improved means of safeguarding will be subject to future OSHA proposals to bring new technology on stream as soon as proven.

39. Q. Does the use of handtools for feeding qualify as a "hands out of dies" operation?

A. Yes.

40. Q. Is compliance with (b)(13) and (b)(14) required when handtools are used for feeding? 1910.217(c)(4), 1910.217(c)(5)

A. No.

41. Q. If presses are operated with "hands out of dies" feeding methods, must safeguarding be provided?

A. Yes.

42. Q. Why?

A. The "hands out of dies" requirement can only be achieved when some form of operator safeguarding is utilized. Handtool feeding, while qualifying as a "hands out of dies" procedure, along with the sliding bolster feeding method, in and of themselves, do not insure that the operator cannot get his hands in the die. These approaches should be used in conjunction with other safety devices; e.g. two-hand trip, Type A and B gates, presence sensing, etc.

43. Q. On presses operated as a "hands out of dies" for feeding must the applicable construction requirements of Section (b) be met?

A. Yes.

44. Q. For controls, foot pedals and controls, brakes and safeguard devices?

A. Yes, the standard as promulgated makes no distinction for presses used for "hands out of die" feeding. It is conceivable that a claim can be made that no operator hazard is present on "hands out of dies" operations; therefore, construction requirements need not be met to insure employee protection from "recognized hazards." The argument, of course, falls on a change to "hands in dies" for a subsequent run. How can a press be reserved exclusively for "hands out of dies" operation and possibly receive a variance?

45. Q. Why are tools required for removal of scrap or stuck work pieces when <u>hand feeding</u> is allowed?

A. Removal and clearing operations are not considered to be as technically difficult as the feeding of dies. The requirement will reduce the number of times that the operator's hands are in the dies and represents a compromise with the former rule for no hands in dies at all times.

46. Q. Can the <u>press control reliability</u> requirement of 1910.217(b)(13) be met on a <u>full revolution clutch press</u>?

A. It is not required on a full revolution clutch press. Claims are being made that such a control criteria can be met on a full revolution clutch press.

47. Q. The new requirements for <u>testing</u> of clutch/brake mechanism, anti-repeat feature, and single stroke mechanism appear to apply to those presses operated on single stroke with "hands in dies" feeding only?
1910.217(c)(5) - Additional requirements for safeguarding

A. The only presses excepted from the rule are those that comply with Section (c)(5) covering control systems (b)(13) and brake monitoring (b)(14).

48. Q. Is a sliding bolster by itself recognized as an acceptable safeguard?

A. No.

49. Q. If a sliding bolster is used to feed parts, are two-hand controls required to meet the safety distance requirements?

A. Yes.

(VIII) <u>SAFETY DISTANCE</u>

50. Q. Where is the safety distance measurement taken from? The die or the edge of the bolster or slide?

A. The safety distance is measured from the point of operation of the die (a recognized hazard). The die dimensions may be less than or greater than the size of the slide or bolster.

51. Q. There are different formulas for calculating the safety distance on part revolution clutch machines using two hand control and full revolution clutch machines using two hand trips. What is the significance of the sub letters Ds, Dm, Ts, and Tm?

A. Different sub letters were used to aid users in recognizing that two separate formulas are used for calculating safety distance depending on the type of clutch.

52. Q. When the safety distance is calculated using the formula, what amount of supplemental distance (margin) is required to determine the point at which controls or trips are located?

A. None; however, it is expected that an additional (margin) distance will be added to allow for some brake stopping time deterioration or slide stopping point tolerance.

53. Q. What is "separation distance?" What is "safety distance?" Are they the same?

A. "Separation distance" is the term used in ANSI B11.1-1975 draft revision of January 24, 1973, which compares with the term "safety distance" used in OSHA.

54. Q. What is meant by separation when describing the position or arrangement of two-hand trips and two-hand controls?

A. OSHA recognizes the use of "separation distance" when applied to locating two-hand control buttons remote from each other to discourage attempts at one-hand actuation.

55. Q. What is the source of the 63" hand speed constant?

A. European studies by Dr. O. Lobl of Sweden which determined a safety distance for use in the regulations of foreign countries.

56. Q. Which formula is proper for finding the safety distance on a part revolution clutch press with two-hand controls?
1910.217(c)(3)(vii)(c)

A. No formula for calculating safety distance on a part revolution clutch press actuated by a two-hand trip is provided. The time recommended would be that for the die closing stroke.

57. Q. Why is the position of approximately 90 degrees of crankshaft rotation chosen for determining <u>brake stopping time</u>?

A. The longest possible stopping time should be used when calculating the safety distance. The point in the stroke near point of maximum speed or half way down was considered to be the best place to measure the longest time for stopping the slide. This conclusion is currently being challenged based on testing by several people.

(IX) <u>RECORDKEEPING</u>

58. Q. How long must the records required by Section 1910.217(e) be kept?

A. Section 1910.217(e) makes no provision for record retention period.

59. Q. Are Federal agencies required to report injuries to press operators?

A. No.

60. Q. Must a written record be kept of pull-out adjustment and testing for each shift change, operator change, or new die set-up?
1910.217(c)(3)(iv)(d)

A. The recordkeeping requirements of 1910.217(e) are applicable.

61. Q. If an employee is injured by a broken piece/part thrown from the die, must a report be sent to the OSHA Office of Standards?

A. No, only injuries to employees which occur within the point of operation are to be reported.

62. Q. Where did the weekly period for inspections come from?

A. ANSI B11.1-1971 explanatory column accompanying requirements for inspections.

63. Q. What periods are recommended by the ANSI B11.1-1971 for press inspections?

A. B11.1-1971 recommended weekly, monthly, or possibly longer periods for press and safeguarding inspections, testing, and maintenance.

64. Q. Are records required to be kept?

A. Yes, B11.1 requires records of inspections.

65. Q. For how long?

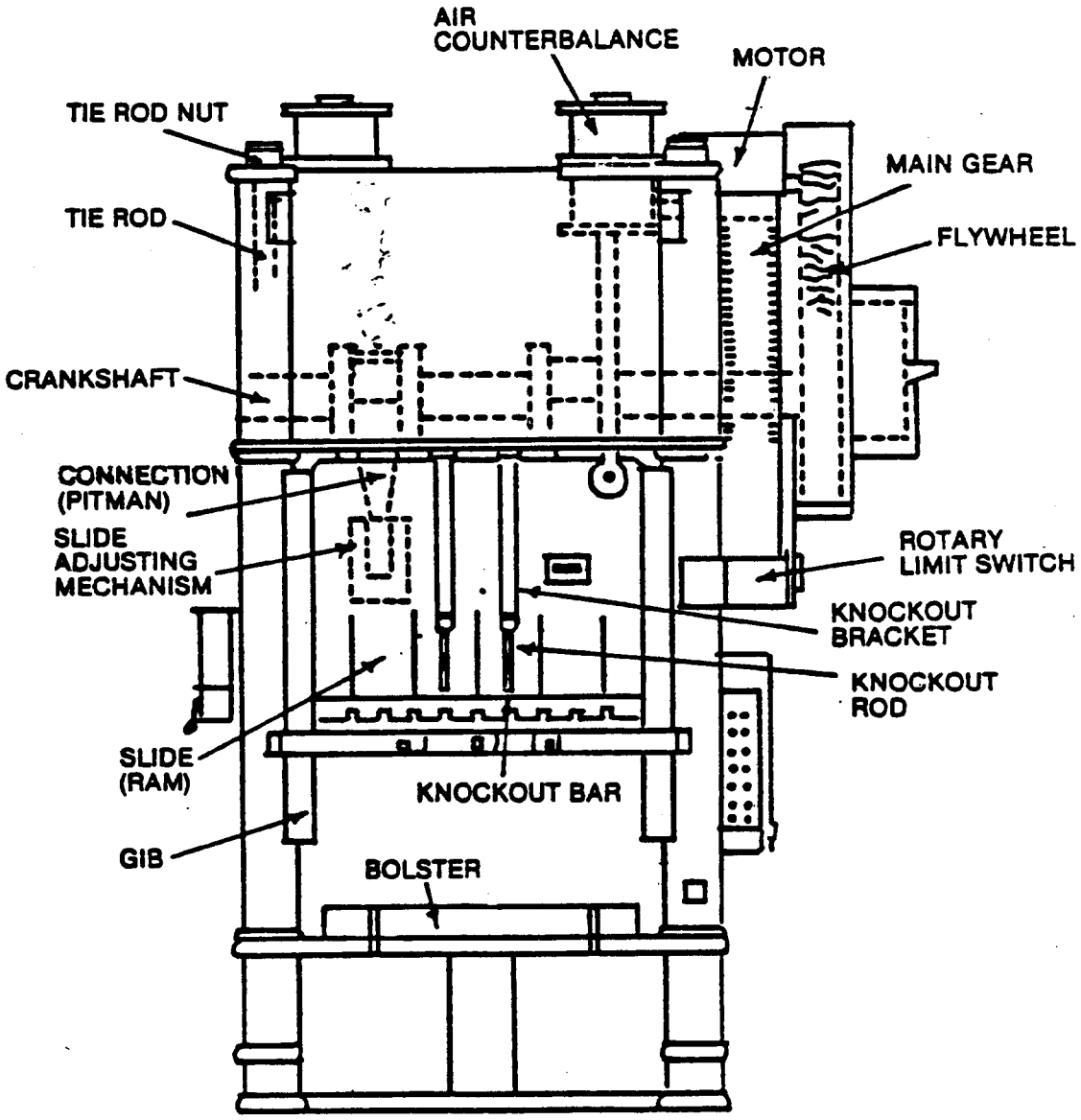
A. No definite retention periods are prescribed by OSHA for power press records.

66. Q. Are periodic inspections and records required for all presses even when operated on continuous or with no hands in dies?

A. Yes, every press is required to be inspected and maintained to protect the safety of operators, die setters, and others.

67. Q. Is it necessary to report minor injuries such as a scratch or pinched finger when feeding a die?

A. No, only report those injuries which qualify for listing on the OSHA Form 200.



A TYPICAL STRAIGHT SIDE PRESS

COUNTERBALANCE AIR PRESSURE DATA PLATE

COUNTERBALANCE AIR PRESSURE

MODEL	10SS	SER. NO.	23876676-P

PRESSURE PSI	UPPER DIE WT-LBS	PRESSURE PSI	UPPER DIE WT-LBS
30	450	70	2,500
40	1,000	80	2,800
50	1,200	90	3,000
60	2,000	100	3,500